

Clarification or Amendment of Solicitation

Date of Issuance: 6/11/25 ¹Solicitation No. RFQ 2963
Purchase Request No. 7355 Clarification or Amendment No. 1

Solicitation due date and hours of offers is changed: ☐ No ☒ Yes, to: 6/20/25 @ 2:00 PM CST/CDT

This document shall serve as official notice of ²Clarification or ³Amendment to the Solicitation identified above. Such notice is being provided to all vendors to which the original solicitation was sent. When a change(s) made to the solicitation materially impact a priced offer by vendors, vendors are to ensure that priced offer is accurate and reflects a change(s) identified in the amendment.

ISSUED BY:

Grand River Dam Authority
Purchasing Unit
PO Box 669
Chouteau, OK 74337

Paul Proctor
Contracting and Acquisitions Agent
918-500-0198
Phone Number
paul.proctor@grda.com
E-Mail Address

Description of Amendment or Clarification:

a. This is to incorporate the following (this box expands based on size of text):

The bid submission deadline has been extended to 6/20/25 @ 2:00 PM CST.
The question submission deadline has been extended to 6/18/25 @ 2:00 PM CST.

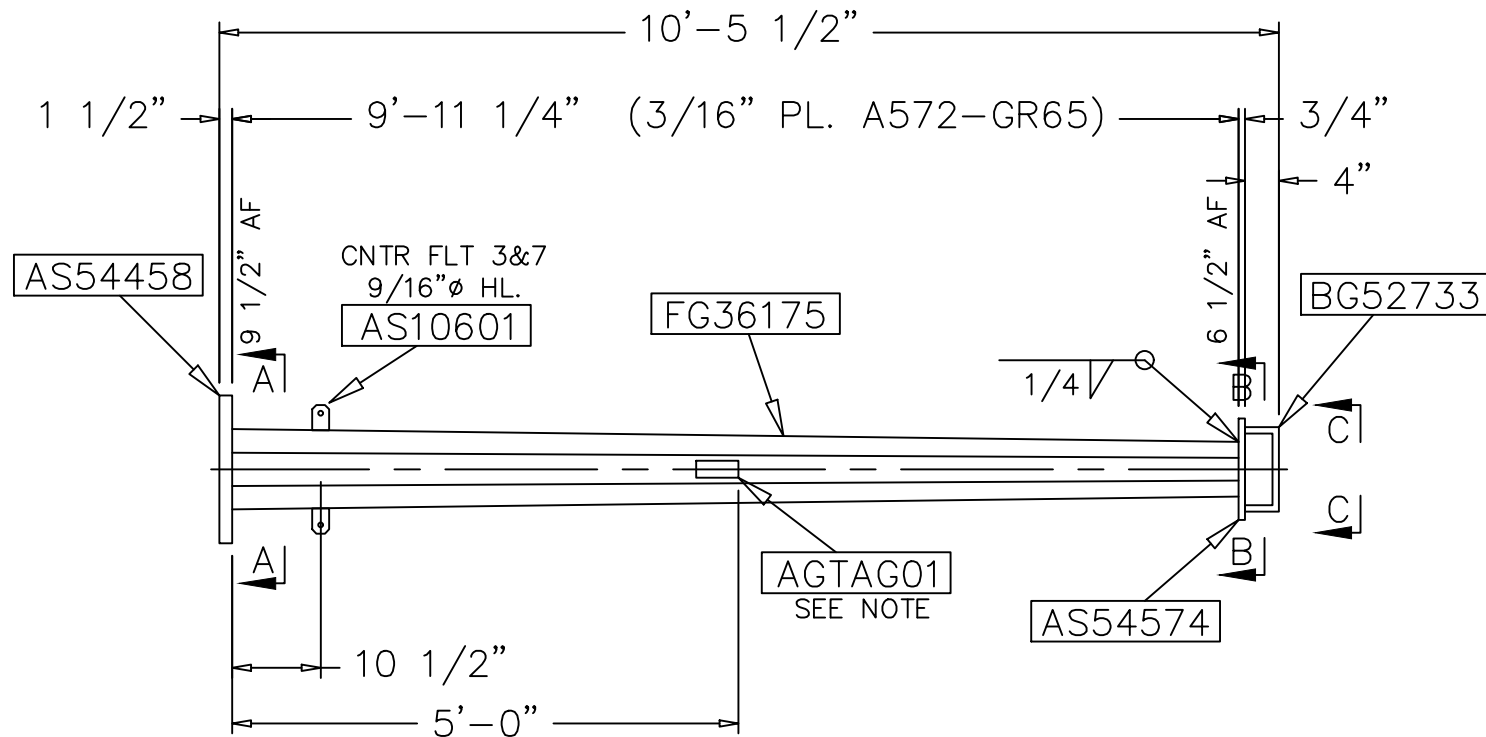
Referenced/Fab drawings and calculations have been provided by request (see attached). A bit of context to help sort these out: Herron substation was originally named 3500 Main Street Substation before it was named after a retired chief engineer at the time of commissioning, so all fabrication drawings will reference 3500 Main. Additionally, This steel was ordered at the same time as the 345/161kV station Igloo Valley, so much of the steel may have been marked as Igloo Valley even though it installed at 3500 Main (Herron). The two bay H-Frame on page 26 of 28 of the attached PDF is installed at Herron.

b. All other terms and conditions remain unchanged.

1. Solicitation means a request or invitation by GRDA for a vendor to submit a priced offer to sell acquisitions to GRDA. A solicitation may be a Request for Quote (RFQ), an Invitation to Bid (ITB), or a Request for Proposal (RFP).
2. Clarification to a solicitation means an additional explanation of all or part of a solicitation that does not change, alter, or supplement the solicitation.
3. An amendment to a solicitation means a written change, addition, correction, or revision to a solicitation.

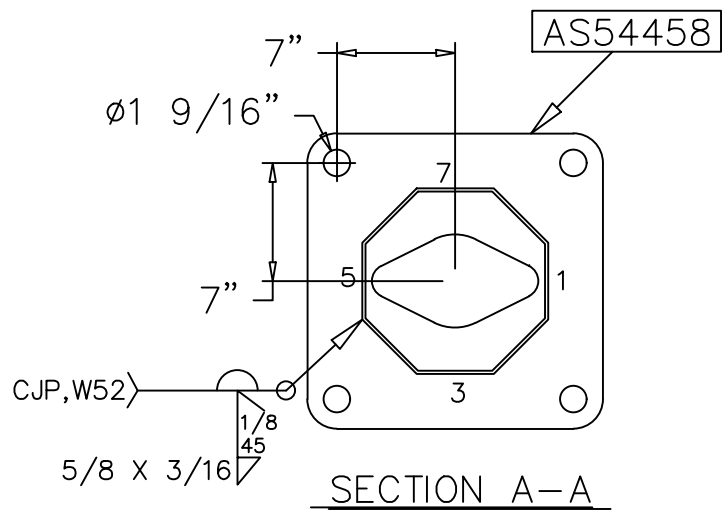
BG52738

BILL OF MATERIAL	
PART NUMBER	QTY.
FG36175	1
AS54458	1
AS54574	1
BG52733	1
AS10601	2
AGTAG01	1

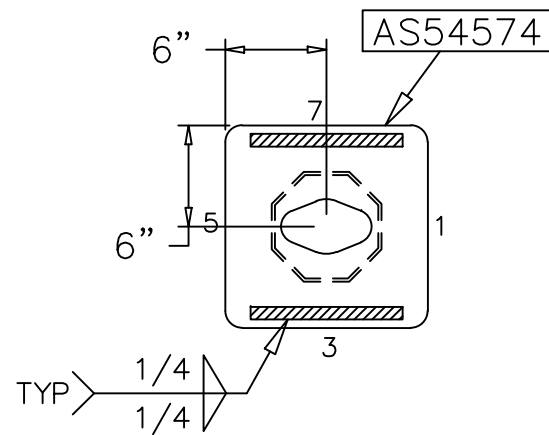


ALL WELDS
UNLESS NOTED $\frac{3}{16}$ 

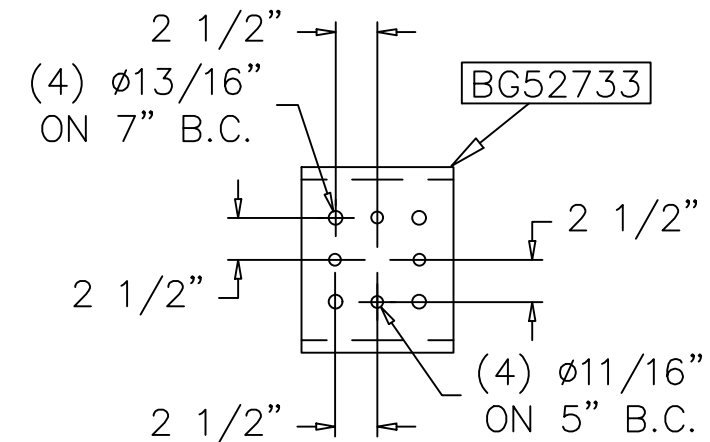
NOTE: STENCIL "BG52738" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



SECTION A-A



SECTION B-B



VIEW C-C

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS01
Description: 161KV 1-PHASE LOW BUS SUPPORT
Valmont #: 433459

REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A MATE

SBS161A1746110006501880022G

WELD: AWS D1.1

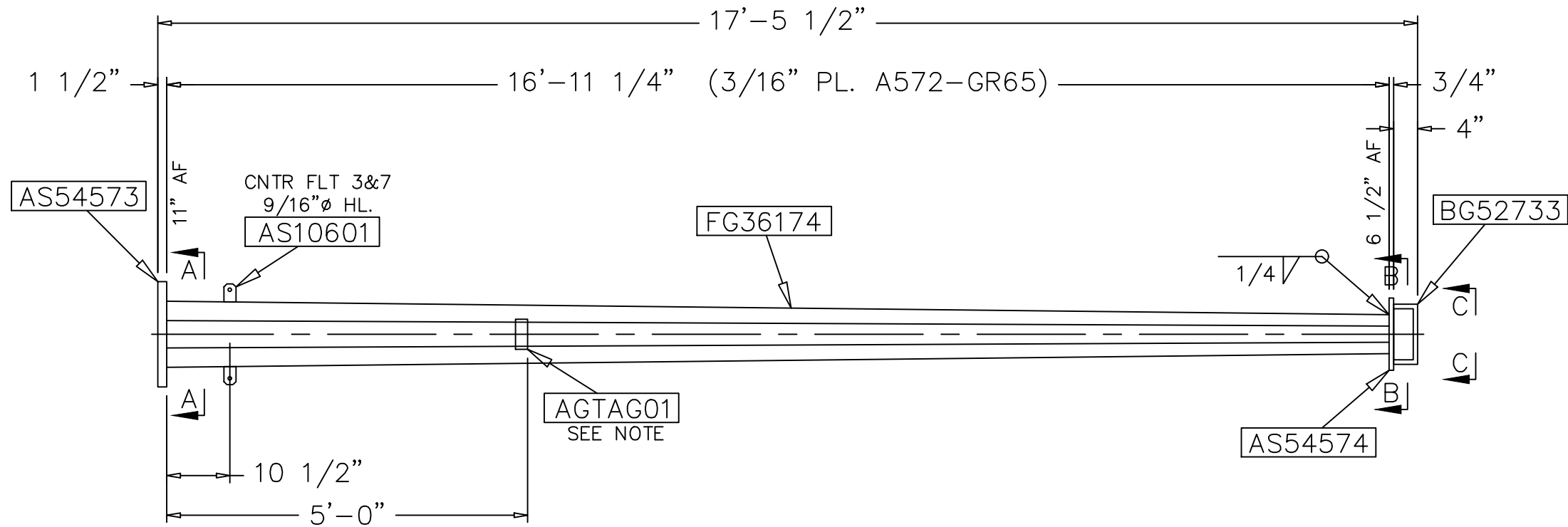
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
RIAL N/A	FINISH F1	WEIGHT	365

valmont 
UTILITY

BG52738

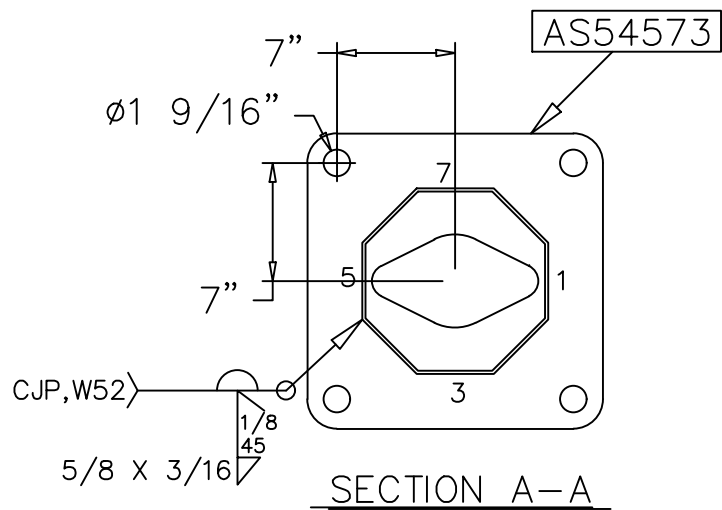
BG52739

BILL OF MATERIAL	
PART NUMBER	QTY.
FG36174	1
AS54573	1
AS54574	1
BG52733	1
AS10601	2
AGTAG01	1

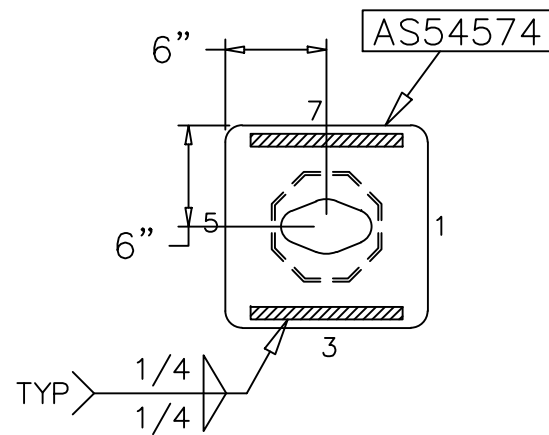


ALL WELDS
UNLESS NOTED $\frac{3}{16}$ 

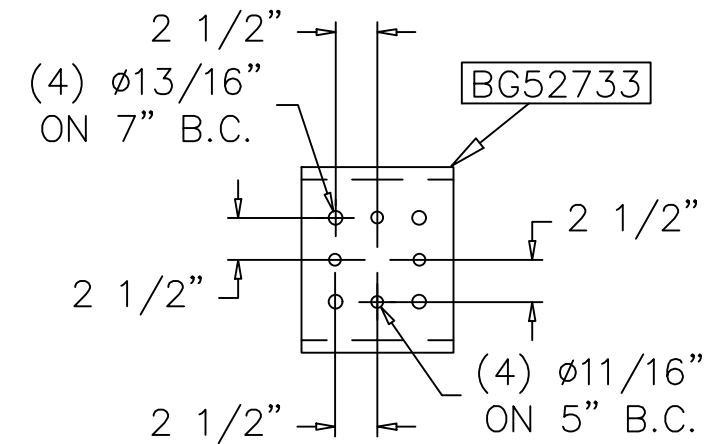
NOTE: STENCIL "BG52739" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



SECTION A-A



SECTION B-B



VIEW C-C

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS02
Description: 161KV 1-PHASE HIGH BUS SUPPORT
Valmont #: 433459

REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A MATE

SBS161A1746110006501880022G

WELD: AWS D1.1

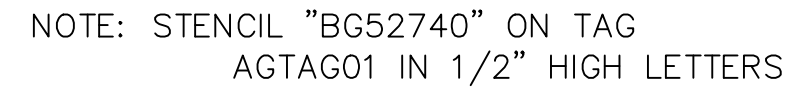
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
RIAL N/A	FINISH F1	WEIGHT	509

valmont 
UTILITY

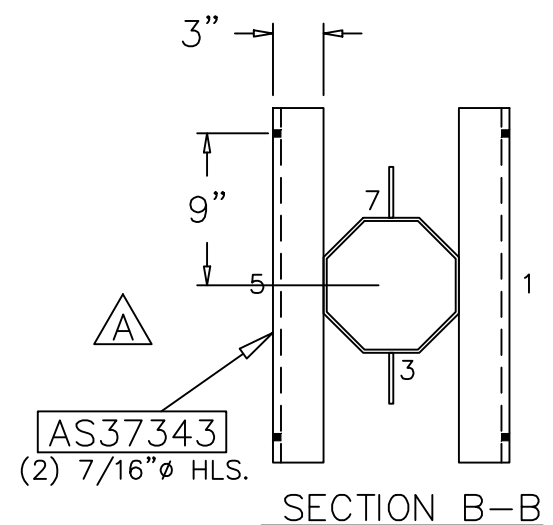
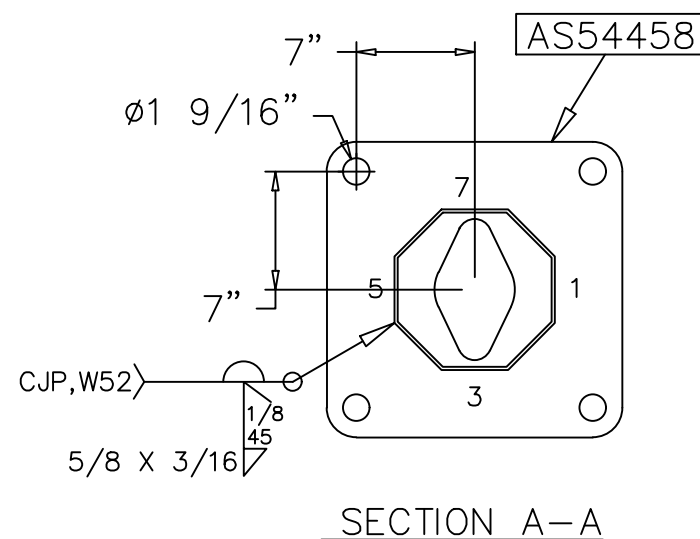
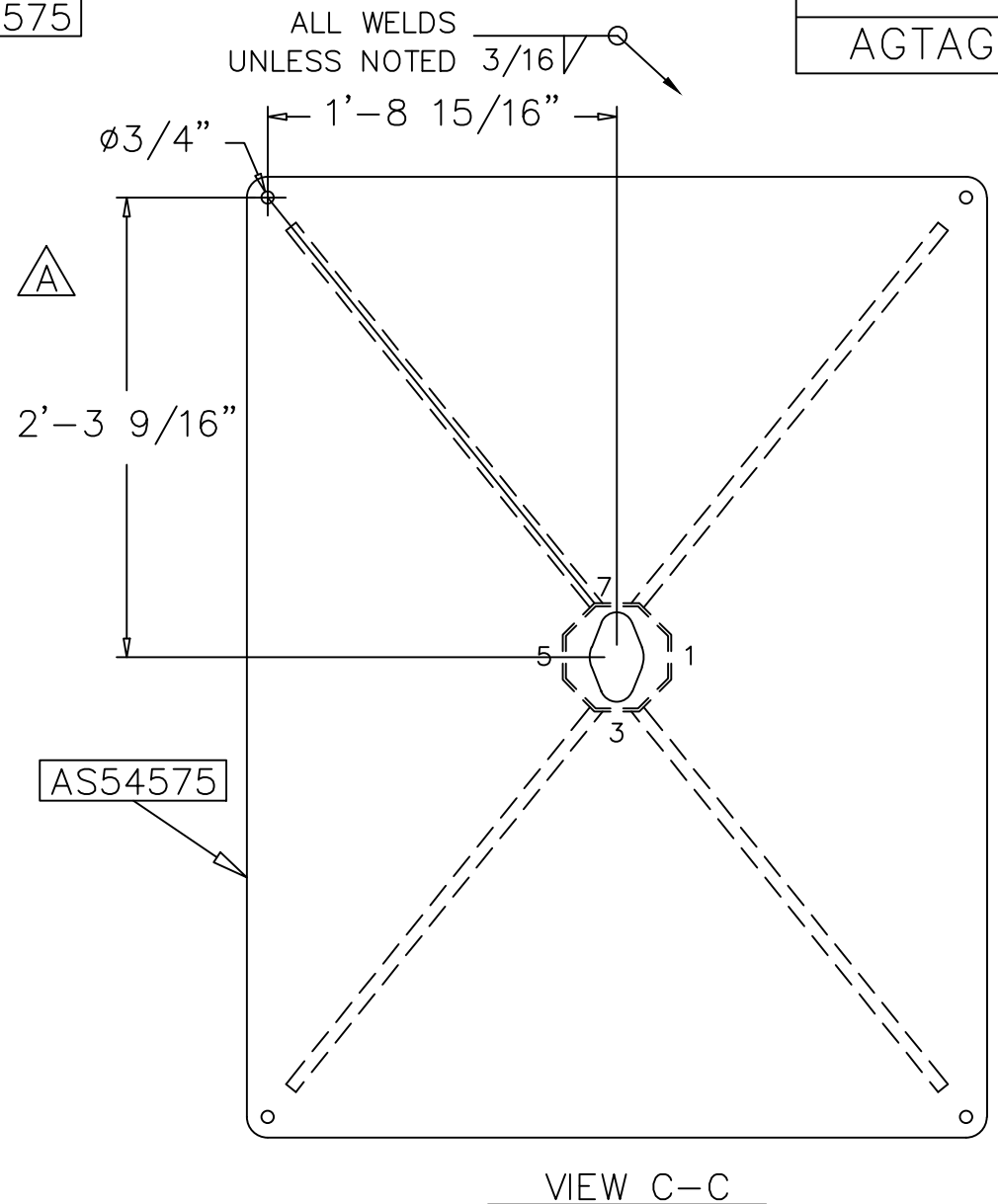
BG52739

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BILL OF MATERIAL	
PART NUMBER	QTY.
FG36176	1
AS54458	1
AS54575	1
AS54576	4
AS10601	6
AS37343	4
AGTAG01	1



ALL WELDS
UNLESS NOTED $\frac{3}{16}$ 



SECTION B-B

VIEW C-C

Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS06
Description: 161KV 1-PHASE SSVT STAND
Valmont #: 433459

A	02/24/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
TOLE	FRANCE	5001 THICK N/A MATE

CTX161A080009500650188022G

WELD: AWS D1.1

DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
TRIAL N/A	FINISH F1	WEIGHT	1332

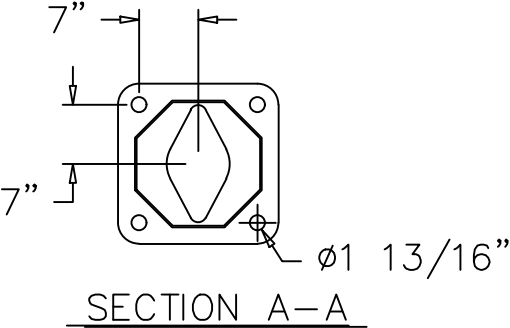
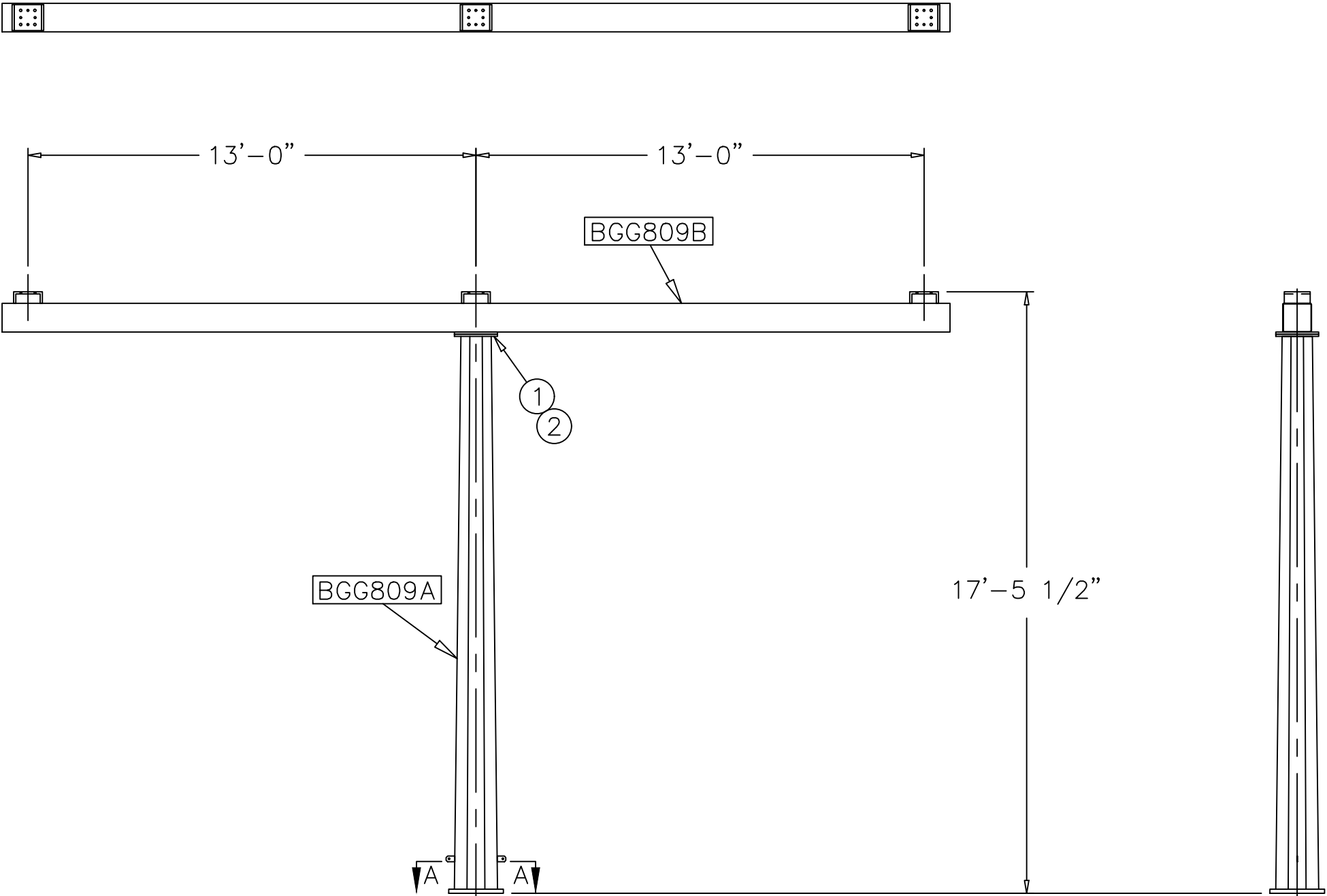
valmont 
UTILITY
BG52740

BGG809Z

TOTAL HARDWARE QUANTITIES TO INCLUDE AN
EXTRA 5 PERCENT OVERAGE

BILL OF MATERIAL
(SHIPPING SEQ. = 1 FOR ALL)

PART NUMBER	DESCRIPTION	UNIT WEIGHT	QTY PER STR.						
BGG809A	COLUMN	642	1						
BGG809B	BEAM	865	1						
AG72627	HARDWARE KIT		1						
DESCRIPTION									
L I N E	PART NUMBER	HARDWARE SIZE				GENERAL	FINISH	ASTM SPEC	QTY
		TYPE	DIA.	LENGTH	THREAD LENGTH				
1	1004217	BOLT	0.75	2.75	1.38		HDGV	A325	5
2	343031	NUT	0.75			DH,LOCK	HDGV	A563	5



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Customer: GRDA
Substation: IGL00 VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS03
Description: 161KV 3-PHASE HIGH BUS SUPPORT
Valmont #: 433459

REV	DATE	DESCRIPTION
TOLERANCE 5001 THICK N/A MATERIAL N/A FINISH F1		

MBA161A1746313001500188070GV

WELD: AWS D1.1

DRAWN

CHECKED

DATE

SCALE

KLK2

KLK2

01-28-19

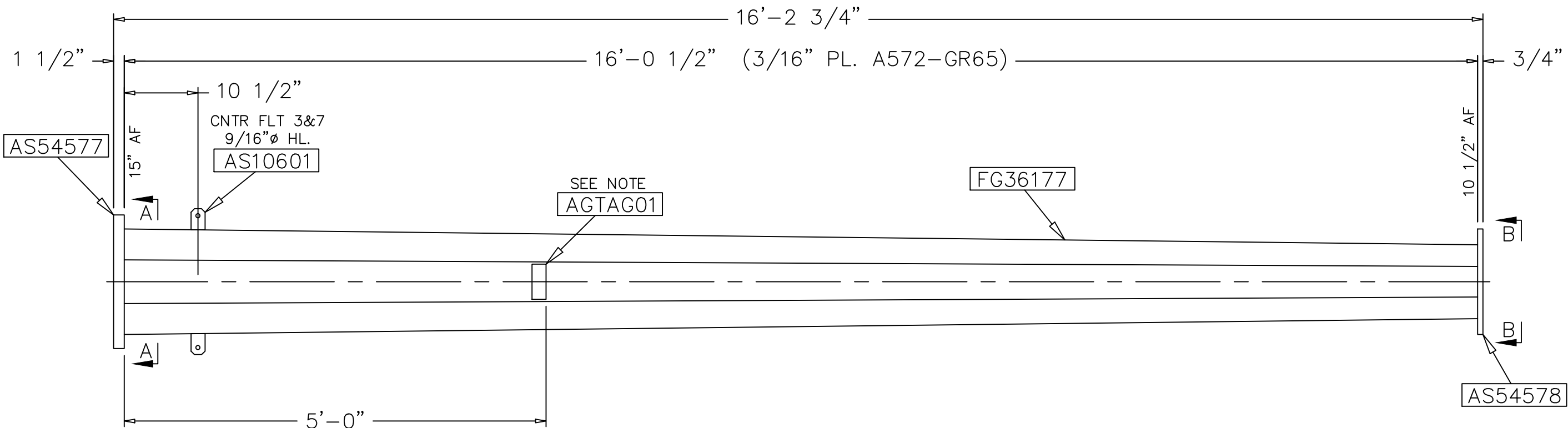
NONE

BGG809Z

BGG809A

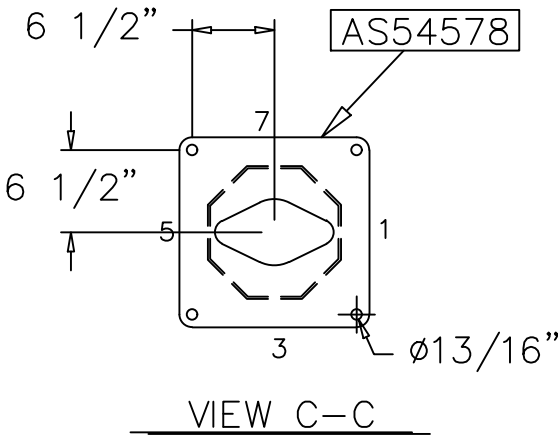
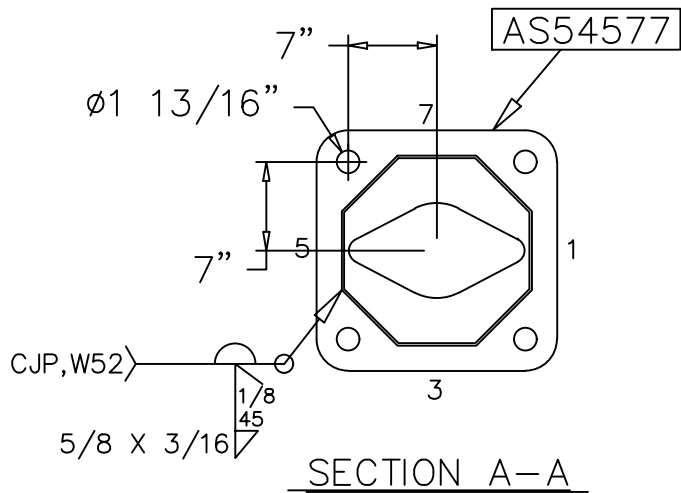
BILL OF MATERIAL

PART NUMBER	QTY.
FG36177	1
AS54577	1
AS54578	1
AS10601	2
AGTAG01	1



ALL WELDS
UNLESS NOTED 3/16"

NOTE: STENCIL "BGG809A" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS03
Description: COLUMN
Valmont #: 433459

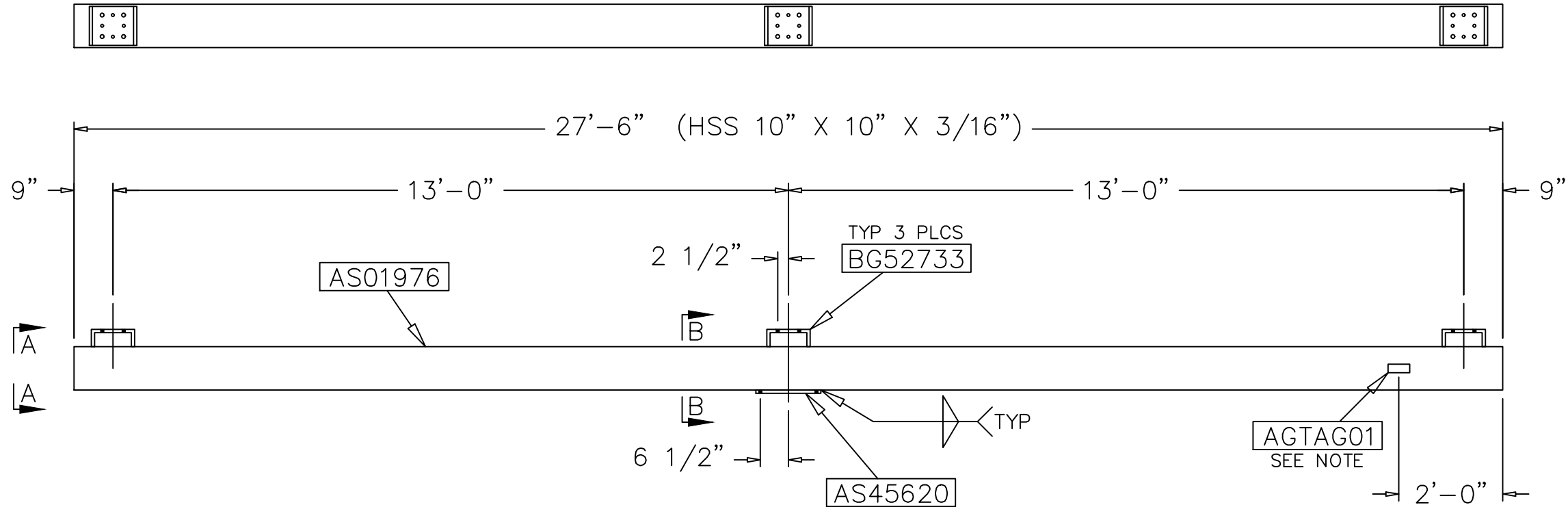
REV	DATE	DESCRIPTION
		TOLERANCE 5001 THICK N/A MATERIAL N/A

SC0A10501500191623022418115007500400813G			
WELD: AWS D1.1			
DRAWN KLK2	CHECKED KLK2	DATE 01-28-19	SCALE NONE
FINISH F1		WEIGHT 642	

BGG809A

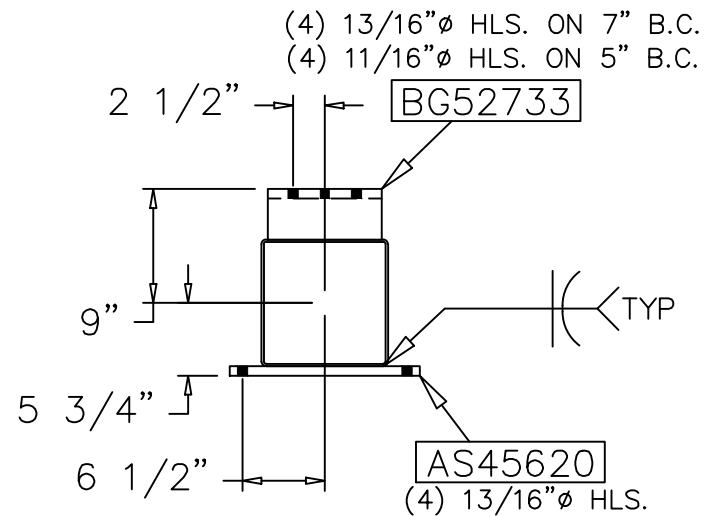
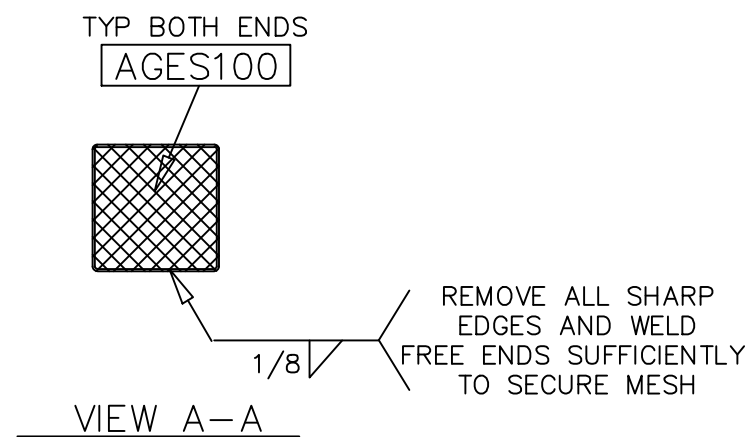
BGG809B

BILL OF MATERIAL	
PART NUMBER	QTY.
AS01976	1
AS45620	1
BG52733	3
AGES100	2
AGTAG01	1



ALL WELDS
UNLESS NOTED 

NOTE: STENCIL "BGG809B" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



SECTION B-B

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS03
Description: BEAM
Valmont #: 433459

REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A MATE

ASA31BU16113000000000G

WELD: AWS D1.1

valmont 
UTILITY

DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
TRIAL N/A	FINISH F1	WEIGHT	865

BGG809B

BGG810Z

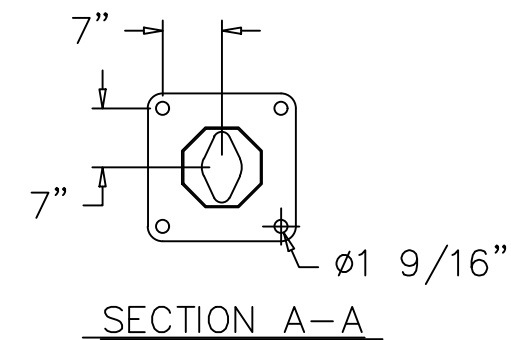
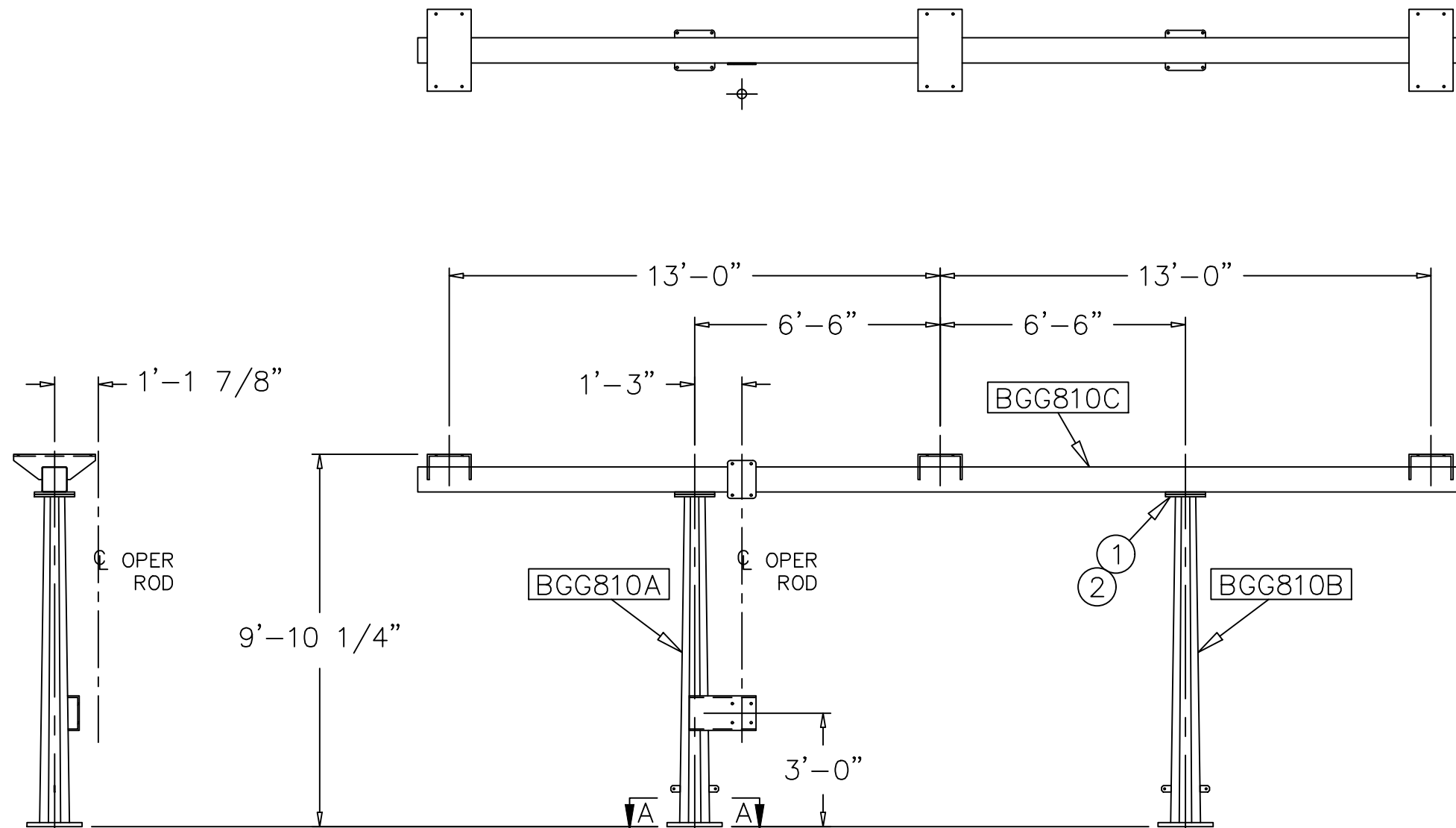
TOTAL HARDWARE QUANTITIES TO INCLUDE AN
EXTRA 5 PERCENT OVERAGE

BILL OF MATERIAL
(SHIPPING SEQ. = 1 FOR ALL)

PART NUMBER	DESCRIPTION	UNIT WEIGHT	QTY PER STR.
BGG810A	COLUMN W/ OPERATOR	348	1
BGG810B	COLUMN	290	1
BGG810C	BEAM	976	1
AS54585	HARDWARE KIT		1

DESCRIPTION

L I N E	PART NUMBER	HARDWARE SIZE				GENERAL	FINISH	ASTM SPEC	QTY
		TYPE	DIA.	LENGTH	THREAD LENGTH				
1	161170	BOLT	0.63	2.50	1.25		HDGV	A325	9
2	333014	NUT	0.63			DH,LOCK	HDGV	A563	9



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS04
Description: 161KV 3-PHASE V-SWITCH STAND
Valmont #: 433459

REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A

SSA161A1300000009850950TS8X8

WELD: AWS D1.1

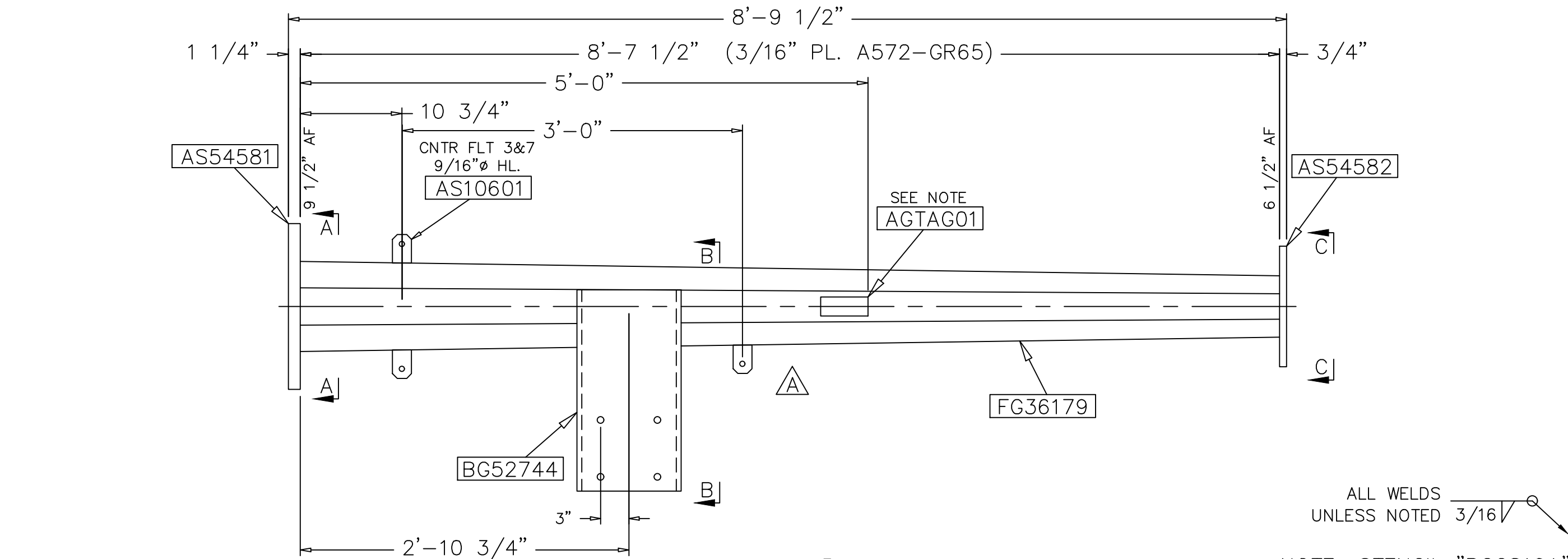
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
MATERIAL N/A	FINISH F1	WEIGHT	1614

valmont UTILITY
BGG810Z

BGG810A

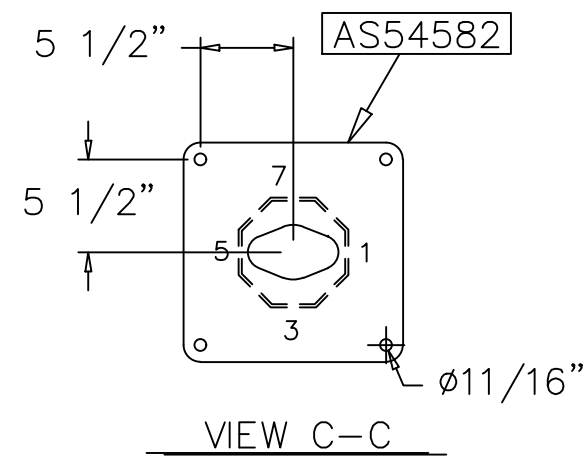
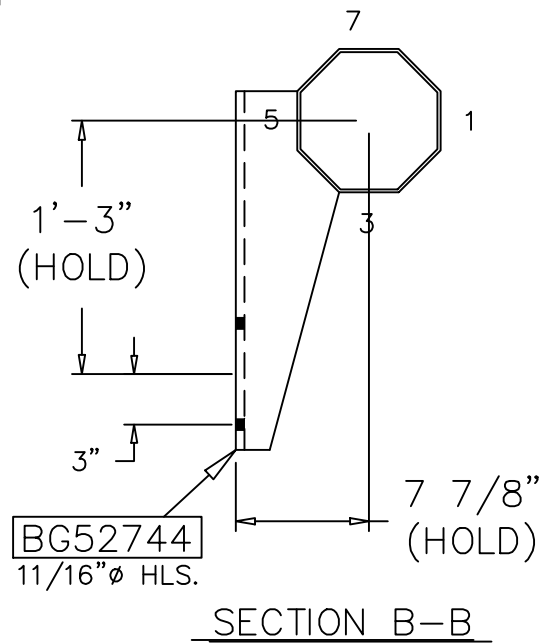
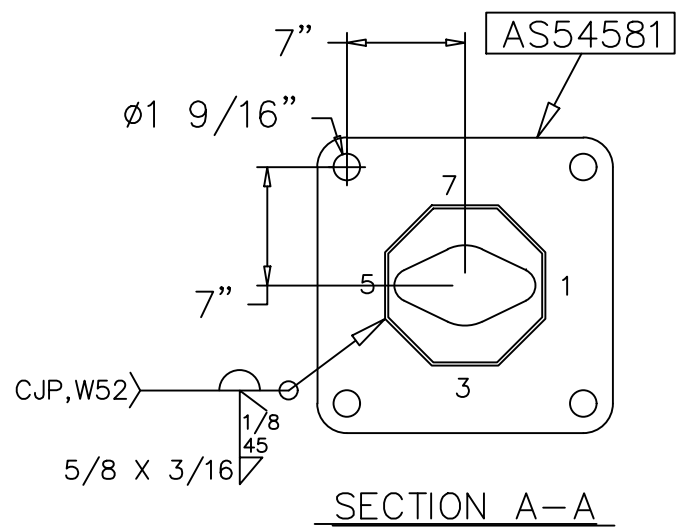
BILL OF MATERIAL

PART NUMBER	QTY.
FG36179	1
AS54581	1
AS54582	1
BG52744	1
AS10601	3
AGTAG01	1



ALL WELDS
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NOTE: STENCIL "BGG810A" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS04
Description: COLUMN W/ OPERATOR
Valmont #: 433459

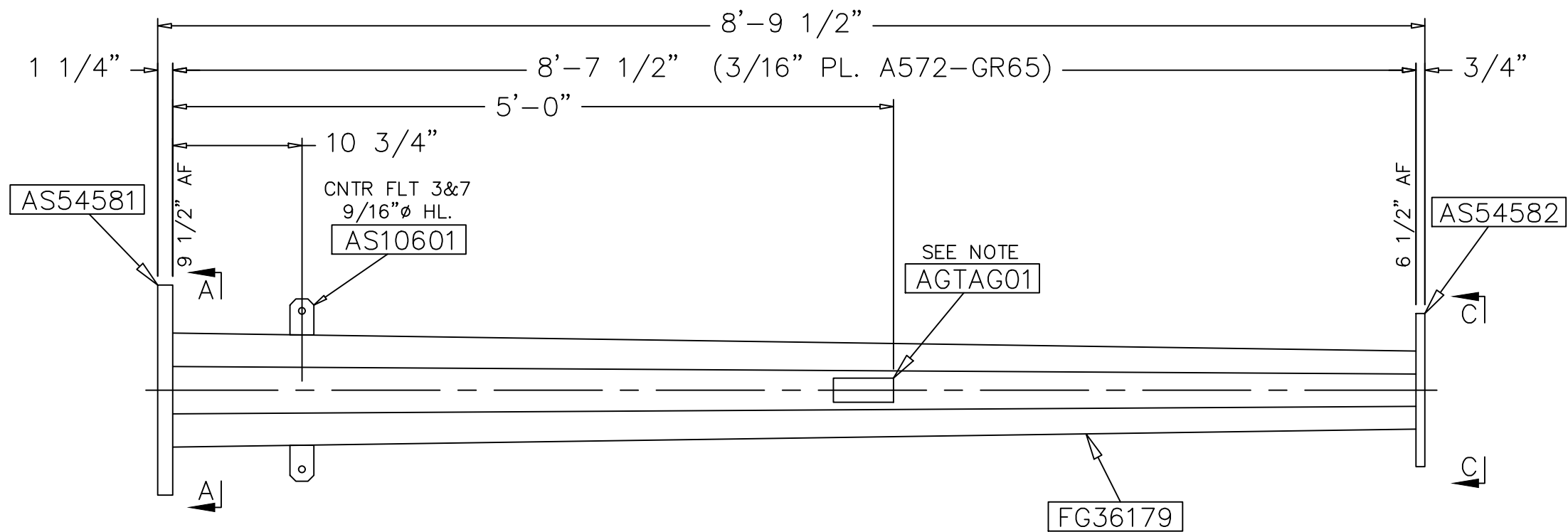
A	02/24/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A

SC0A06500950190879022412515607500400688G			
WELD: AWS D1.1			
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
MATERIAL N/A	FINISH F1	WEIGHT	348

BGG810A

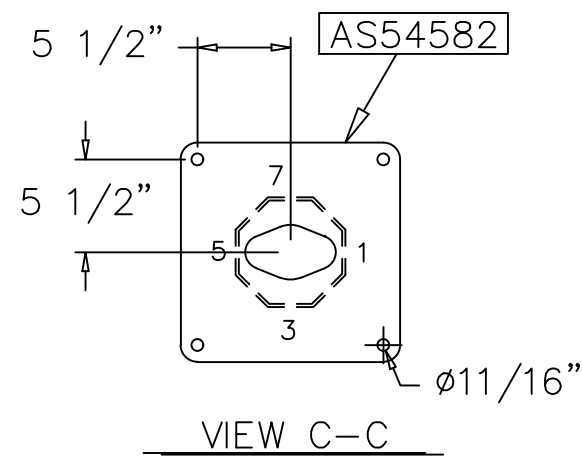
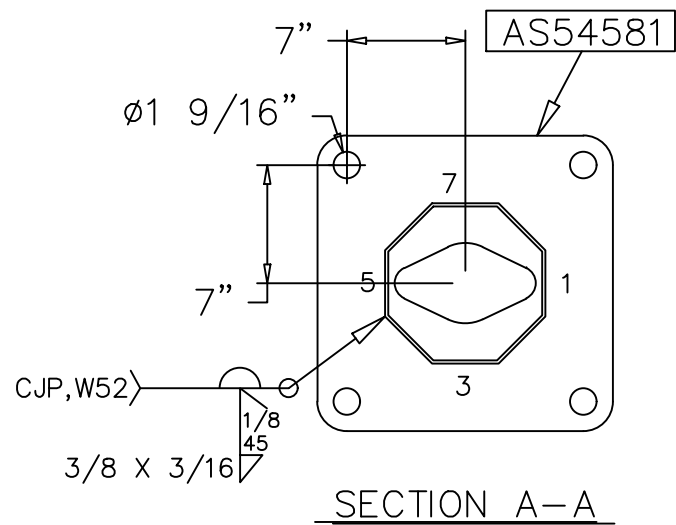
BGG810B

BILL OF MATERIAL	
PART NUMBER	QTY.
FG36179	1
AS54581	1
AS54582	1
AS10601	2
AGTAG01	1



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AGTAG01 IN 1/2" HIGH LETTERS



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS04
Description: COLUMN
Valmont #: 433459

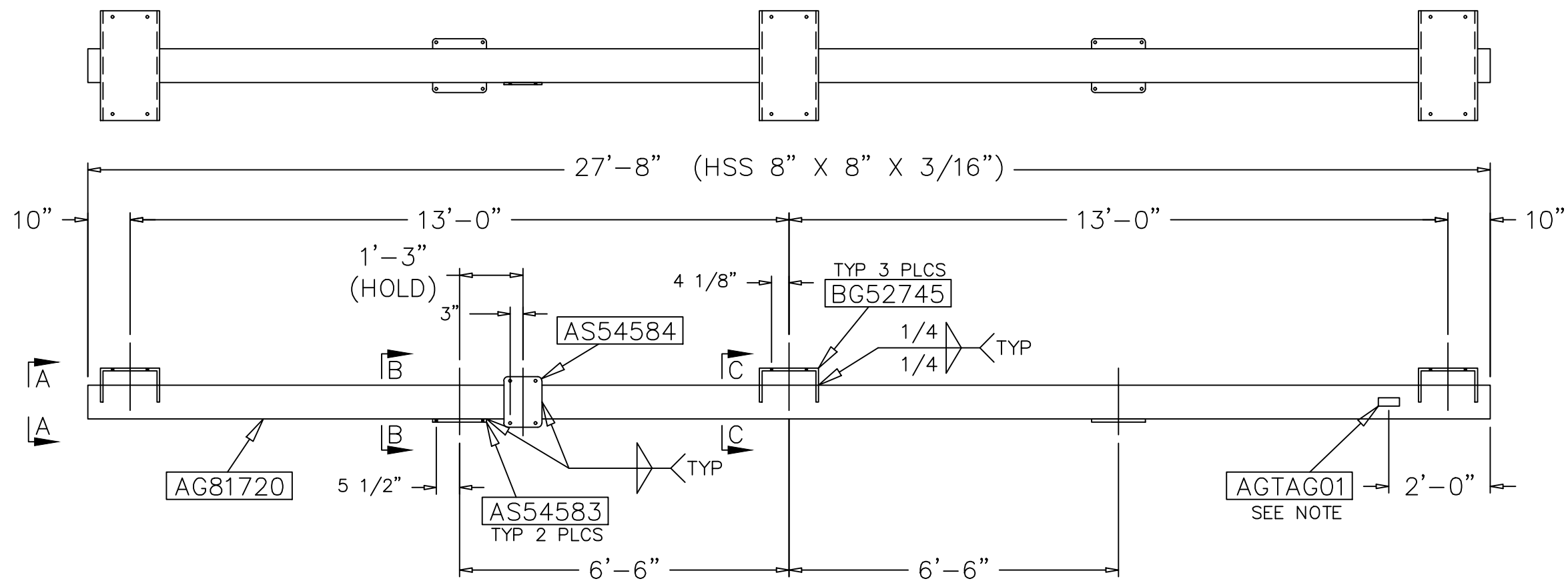
REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A

SC0A06500950190879022412515607500400688G			
WELD: AWS D1.1			
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
TOLERANCE 5001 THICK N/A MATERIAL N/A		FINISH F1 WEIGHT 290	

valmont
UTILITY
BGG810B

BGG810C

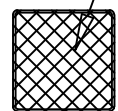
BILL OF MATERIAL	
PART NUMBER	QTY.
AG81720	1
AS54583	2
BG52745	3
AS54584	1
AGES080	2
AGTAG01	1



NOTE: STENCIL "BGG810C" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS

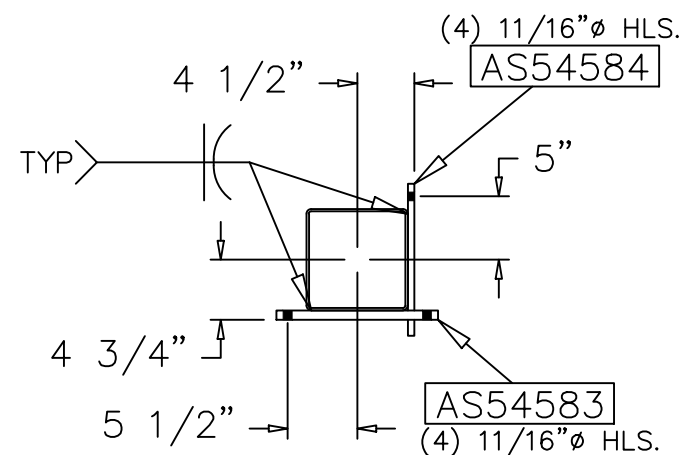
ALL WELDS
UNLESS NOTED $\frac{3}{16}$

TYP BOTH ENDS
AGES080

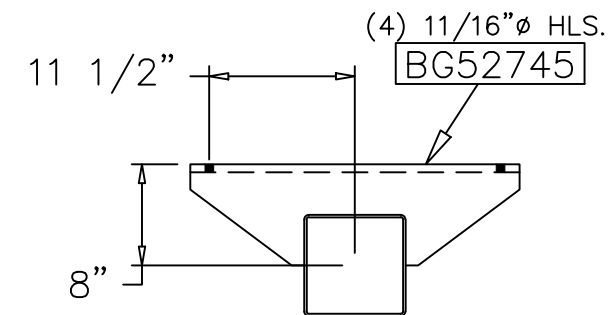


REMOVE ALL SHARP
EDGES AND WELD
FREE ENDS SUFFICIENTLY
TO SECURE MESH

VIEW A-A



SECTION B-B



SECTION C-C

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS04
Description: BEAM
Valmont #: 433459

REV	DATE	DESCRIPTION

ASA32SW1611300013000G			
5	10	15	20
25	30	35	
WELD: AWS D1.1			
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-28-19	NONE
TOLERANCE 5001	THICK N/A	MATERIAL N/A	FINISH F1
			WEIGHT 976

valmont
UTILITY
BGG810C

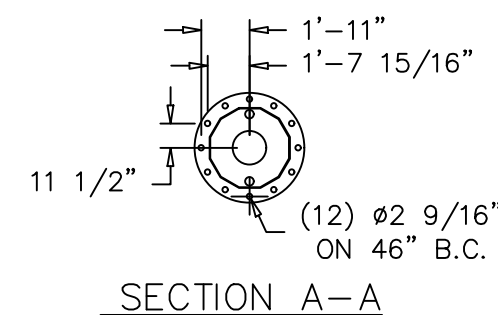
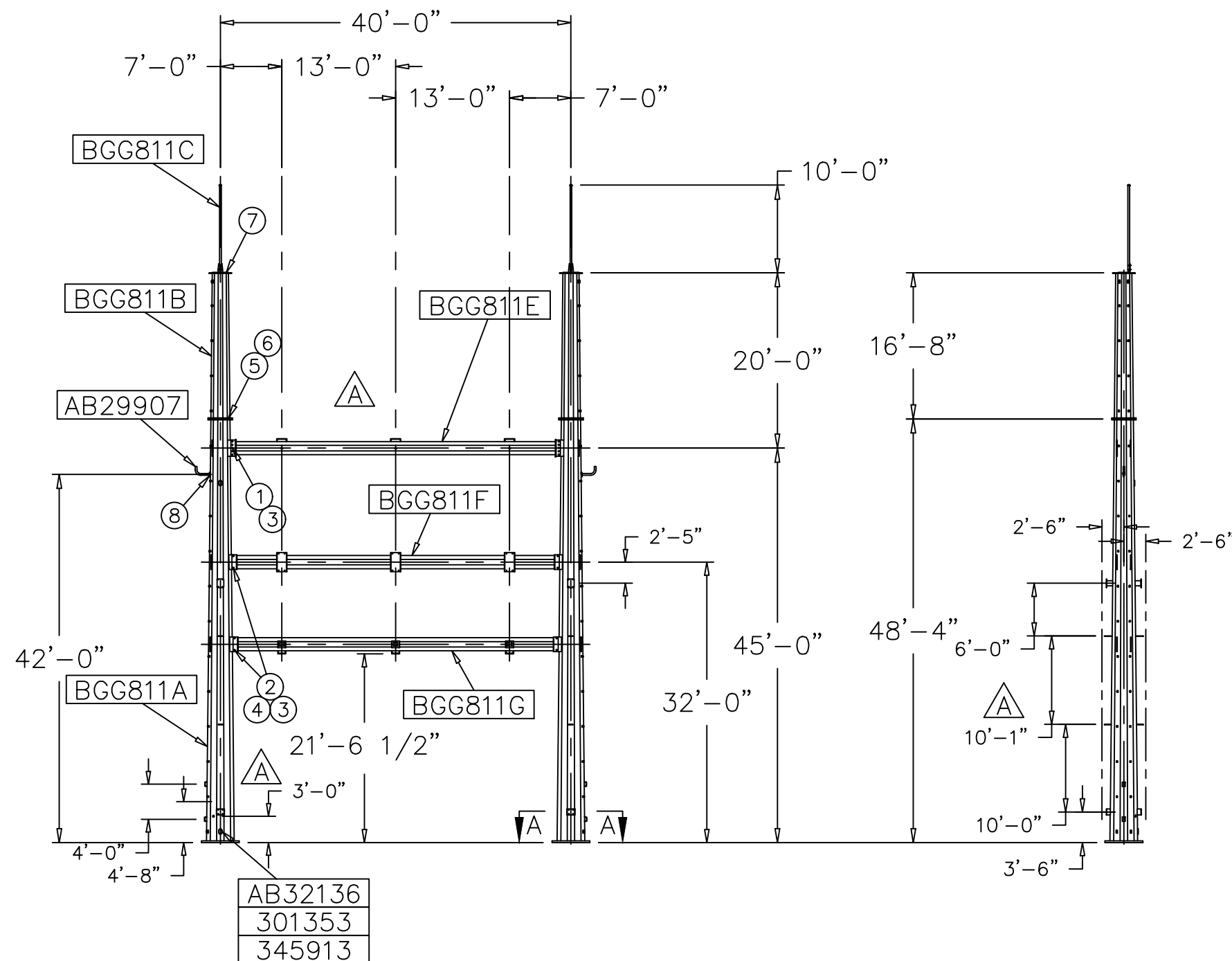
BGG811Z

TOTAL HARDWARE QUANTITIES TO INCLUDE AN
EXTRA 5 PERCENT OVERAGE

BILL OF MATERIAL
(SHIPPING SEQ. = 1 FOR ALL)

PART NUMBER	DESCRIPTION	UNIT WEIGHT	QTY PER STR.
BGG811A	END COLUMN BASE SECTION	10088	2
BGG811B	UPPER COLUMN SECTION	1823	2
BGG811C	SPIKE ASSEMBLY	104	2
BGG811E	CONDUCTOR BEAM	2583	1
BGG811F	SWITCH BEAM	3058	1
BGG811G	INSULATOR BEAM	2406	1
AB29907	LIGHT MOUNTING ARM	10	2
AB32136	HAND HOLE COVER	1	4
301353	COVER MOUNTING BAR		4
345913	COVER MOUNTING SCREW		4
AS54631	HARDWARE KIT		1

DESCRIPTION

[illegible]

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SECTION A-A

Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS07
Description: 161KV 1-BAY H-FRAME DEADEND
Valmont #: 433459

A	02/07/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A MATE

HFA16145002000000000000400001

WELD: AWS D1.1



DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE
RIAL N/A	FINISH F1	WEIGHT	32103

BGG811Z

BILL OF MATERIAL		
PART NUMBER	QTY	SHIP
AB42143	1	0

SHIP

0

1.00" (REF)

AB42143

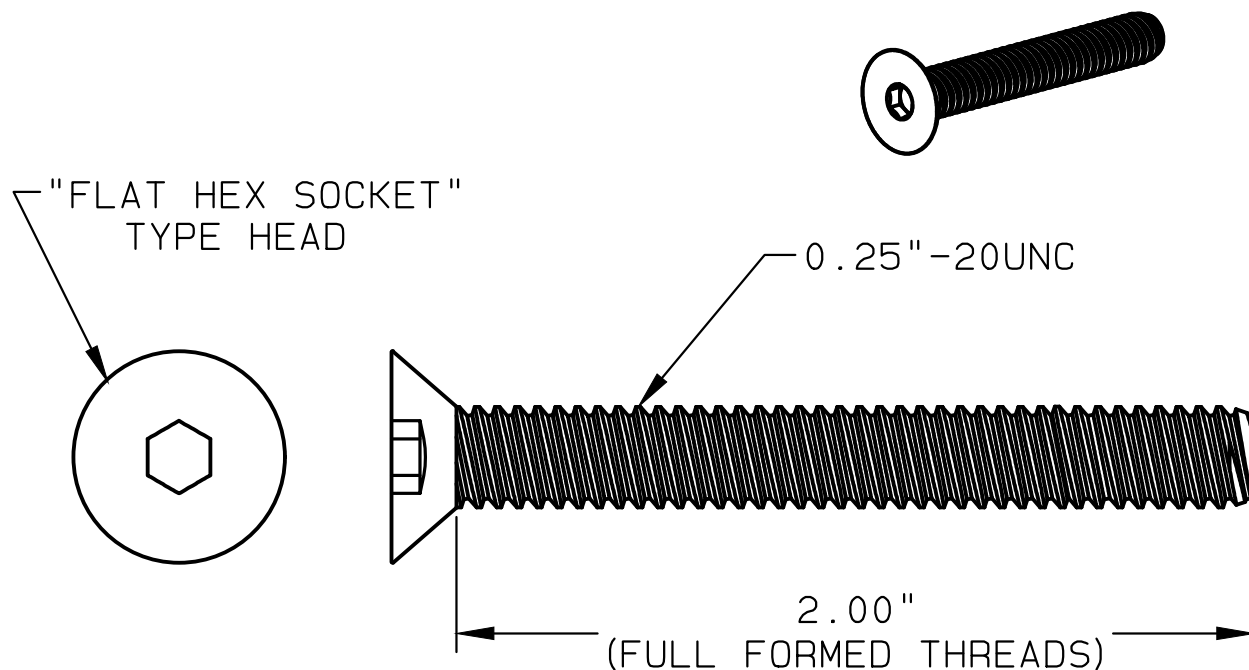
AB42143

-1.00" (REF)

-0.75" (REF)

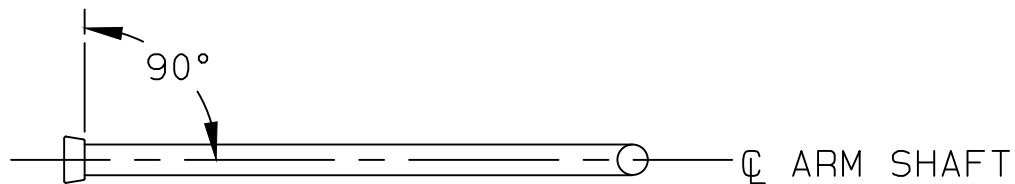
FORMED VIEW

F	05/24/05	UPDATED PROD DESCRIPTION		CWF	PROD. CODE (2) <u>04</u> S. CODE (1) <u>28</u> ELS (7) <u>27</u> STD. IND. (1) <u>02</u> UOM (2) <u>PC</u> SHIP FLAG (1) <u>29</u> CLASS CODE (1) <u>B</u> CLASS NO (3) <u>870</u>															
E	12/17/97	UPDATED TO E-VAULT		TJS	BUS010006752500GV.2520UNCCH															
D	04/12/89	REVISED DESCRIPTION		JC	DWG. SIZE (1) <u>A</u> PURC. L. T. (5) <u>87</u> CONTROL (1) <u>102</u> MATL. COST (5.4) <u>07</u> PL. CODE (1) <u>41</u> WEIGHT (7) <u>0.500</u>															
C	04/12/89	UPDATED		DM																
B	04/12/89	WAS "B" SIZE		DM																
REF. (107)	DATE	REVISION DESCRIPTION			<u>MATERIAL THICKNESS</u> N. A.		<u>DATE</u> 04/12/88	<u>DRAWN</u> DM	<u>CHECKED</u> JC		<u>SCALE</u> NONE		301353							
SPECIFICATIONS		MATERIAL: HRMS		TOL.: M-30			DUPLICATE DRAWING DISTRIBUTION		04		38		PART NUMBER							
		FINISH: F318		WELD: N. A.					37		40									



MATERIAL NOTE:
STAINLESS STEEL

				PROD. CODE (2) <u>04</u> S. CODE (1) <u>28</u> ELS (7) <u>02</u> STD. IND. (1) <u>15</u> UOM <u>PC</u> SHIP FLAG (1) <u>29</u> CLASS CODE (1) <u>A</u> CLASS NO (3) <u>103</u>										valmont 			
				SCR FH 1/4 X 2 / SS HEX SOCKET HD													
				DWG. SIZE (1) <u>A</u> PURC. L. T. (5) <u>66</u> CONTROL (1) <u>87</u> MATL. COST (5.4) <u>102</u> PL. CODE (1) <u>07</u> WEIGHT (7) <u>41</u>													
REF. (107)	DATE	REVISION DESCRIPTION		MATERIAL THICKNESS		DATE	DRAWN	CHECKED		SCALE		0345913					
				N/A		12/01/87	JF	GM		2.000							
SPECIFICATIONS		MATERIAL: NOTED		TOL.: M-30			DUPLICATE DRAWING DISTRIBUTION	04		38		PART NUMBER					
		FINISH: N/A		WELD: N/A				37		40							



BILL OF MATERIAL

PART NUMBER

QTY

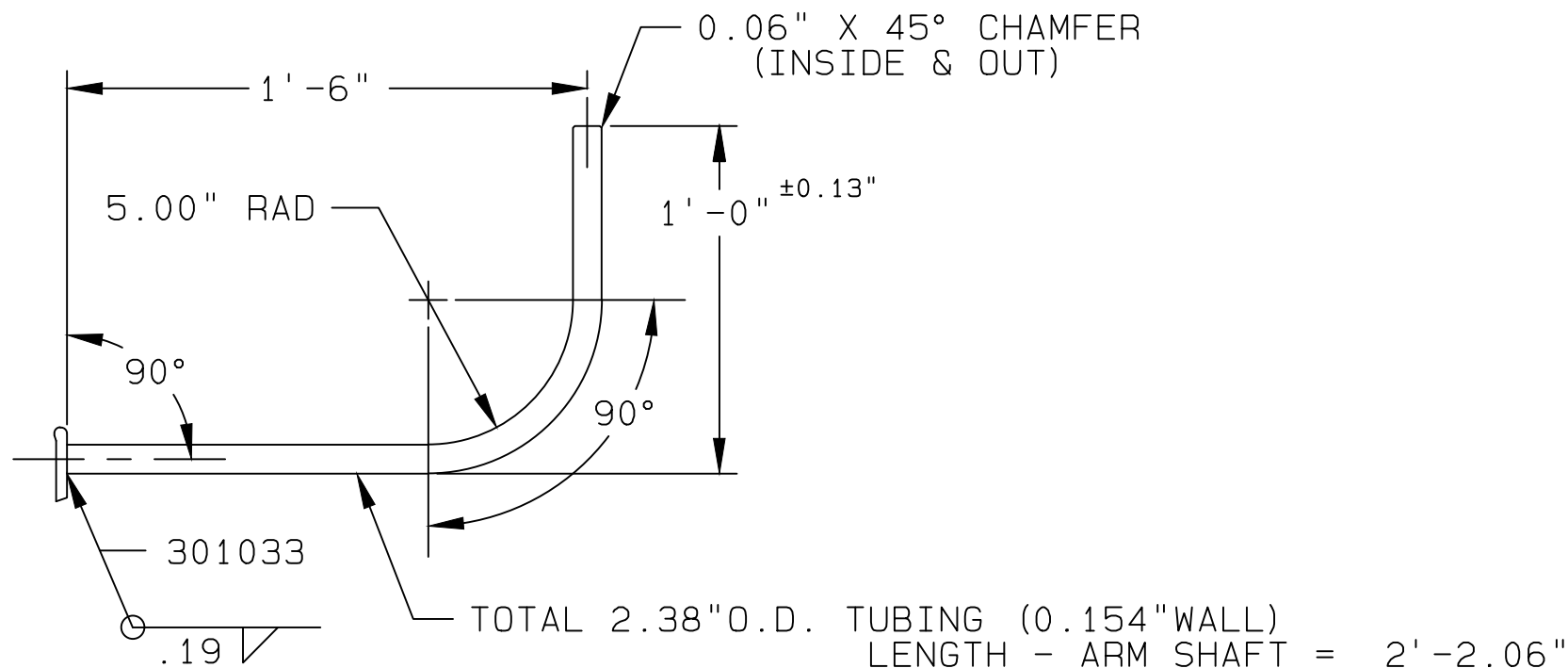
SHIP

301033

1

0

RADIAL INDEX FOR ARM ATTACHMENT LOCATION



PROD. CODE (2) 04 S. CODE (1) 27 ELS (7) 02 STD. IND. (1) 15 UOM PC SHIP FLAG (1) 29 CLASS CODE (1) 35 CLASS NO (3) 069 **valmont**

ALAM0080016010G STD

DWG. SIZE (1) A PURC. L. T. (5) 87 CONTROL (1) 102 MATL. COST (5.4) 07 PL. CODE (1) 41 WEIGHT (7) 10

A 03/08/95 UPDATED TO CAD MRD

REF. (107) DATE REVISION DESCRIPTION

SPECIFICATIONS MATERIAL: S109 TOL.: M-30 FINISH: F-1 WELD: W-999

MATERIAL THICKNESS

NOTED

DATE 05/27/87

DRAWN GJM

CHECKED

SCALE NONE

DUPLICATE DRAWING DISTRIBUTION

04 37

38 40

AB29907

PART NUMBER

BILL OF MATERIAL

PART NUMBER

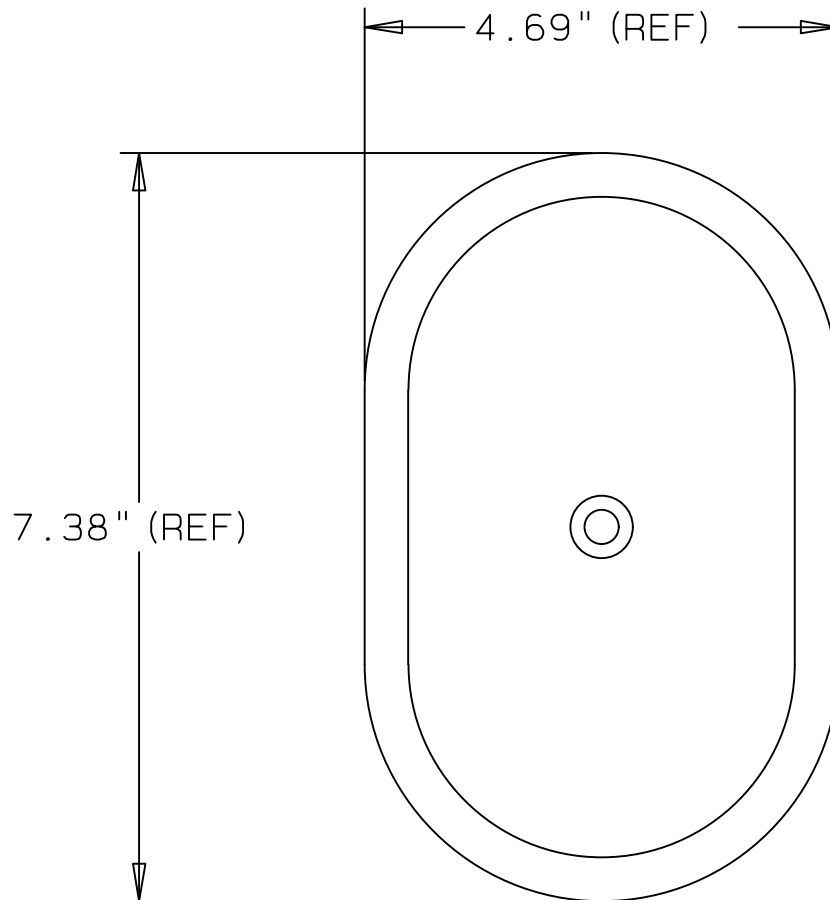
QTY

SHIP

BB11082

1

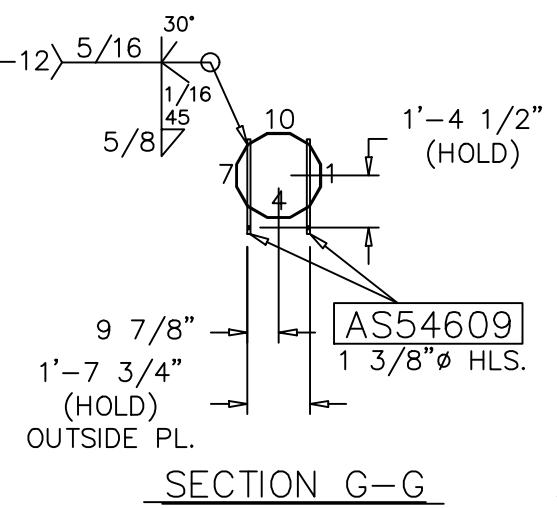
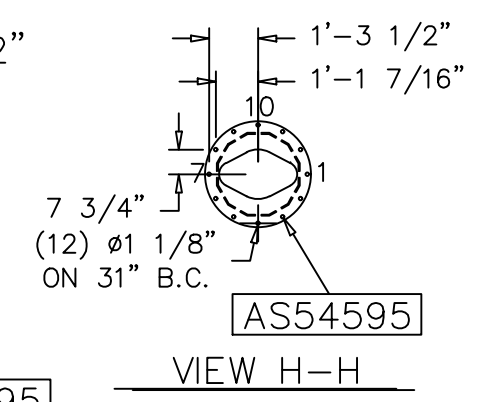
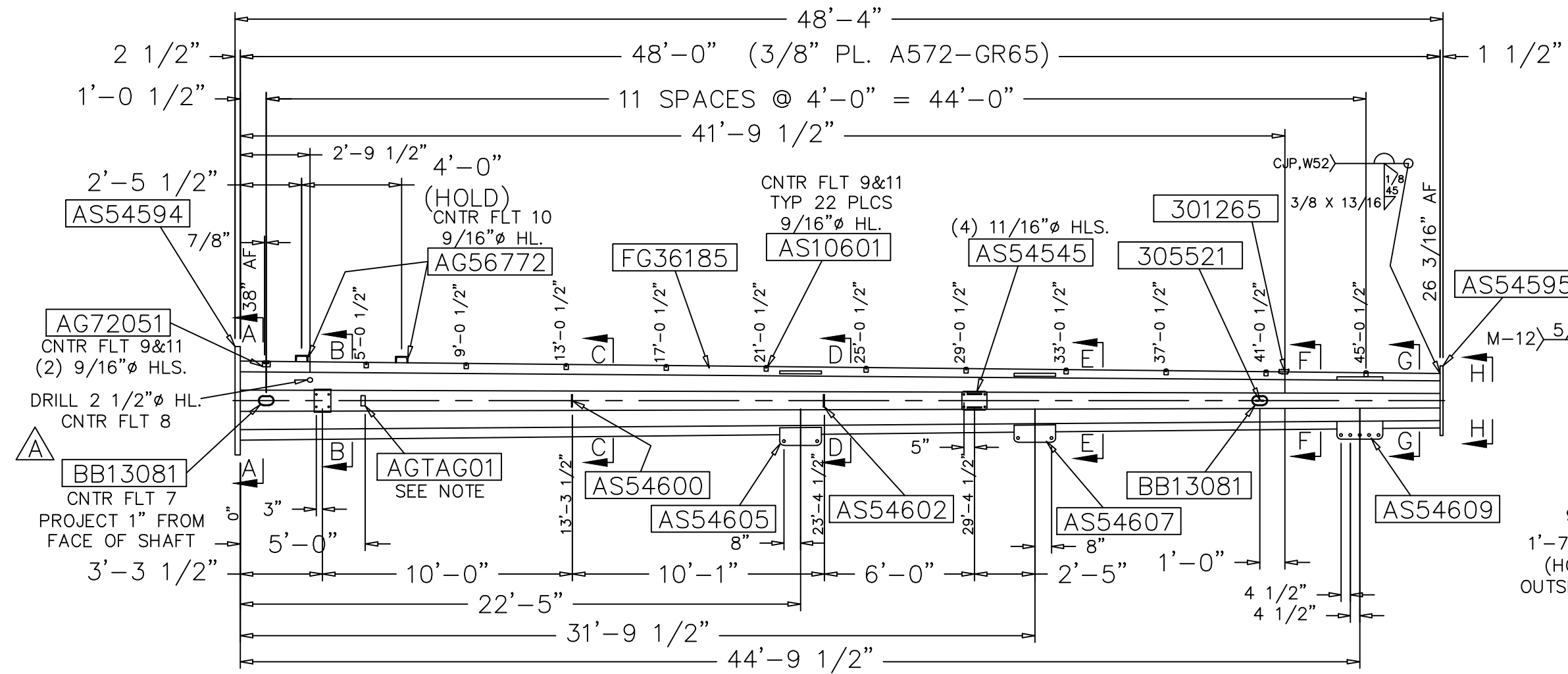
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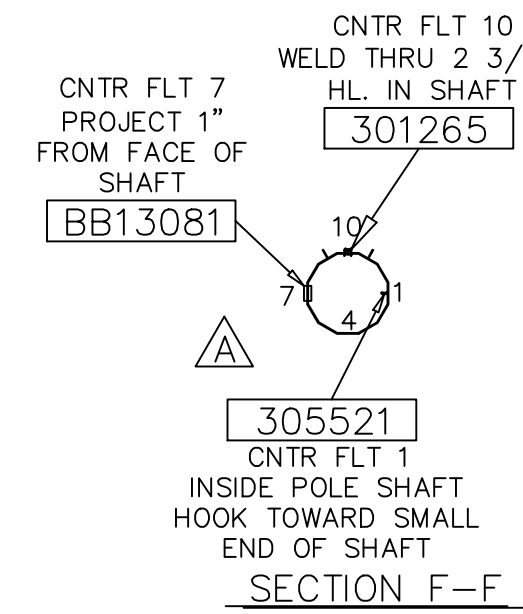
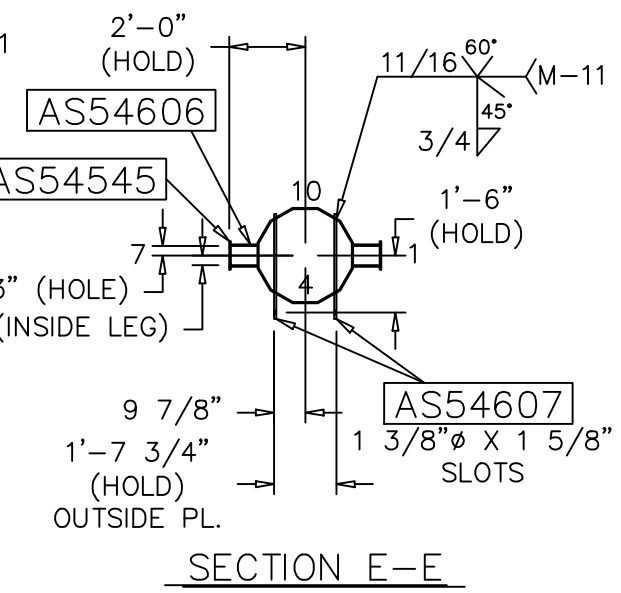
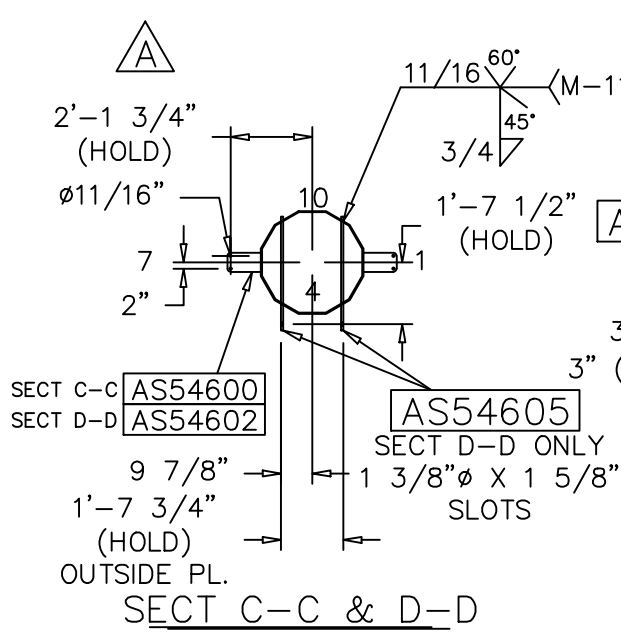
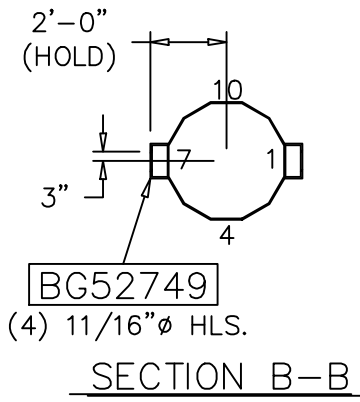
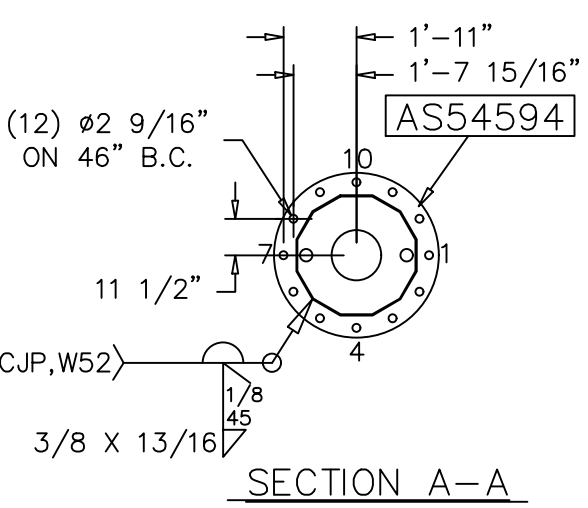
BB11082-HANDHOLE COVER-BLK

				PROD. CODE (2) <u>04</u> S. CODE (1) <u>28</u> ELS (7) <u>02</u> STD. IND. (1) <u>15</u> UOM (2) <u>PC</u> SHIP FLAG (1) <u>29</u> CLASS CODE (1) <u>B</u> CLASS NO (3) <u>870</u>												
				HHC040X065GVCA SPCL COUNTERSUNK HOLE												
E	12-23-97	UPDATED TO E-VAULT		TJS	DWG. SIZE (1) <u>A</u> PURC. L. T. (5) <u>87</u> CONTROL (1) <u>102</u> MATL. COST (5.4) <u>07</u> PL. CODE (1) <u>41</u> WEIGHT (7) <u>0001.08</u>											
D	03-31-89	FINISH WAS F1		DM												
C	03-31-89	CHANGE TO BLK. NUM.		DM												
REF. (107)	DATE	REVISION DESCRIPTION			MATERIAL THICKNESS N.A.		DATE 09/18/87		DRAWN JM		CHECKED GM		SCALE NONE		AB32136	
SPECIFICATIONS		MATERIAL: N.A.		TOL.: M-30	N.A.				DUPLICATE DRAWING DISTRIBUTION		04		38		PART NUMBER	
		FINISH: F318		WELD: N.A.							37		40			

BGG811A



NOTE: STENCIL "BGG811A" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



ALL WELDS
UNLESS NOTED 3/16"

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BILL OF MATERIAL	
PART NUMBER	QTY.
FG36185	1
AS54594	1
AS54595	1
AS54605	2
AS54607	2
AS54609	2
BG52749	2
AS54600	2
AS54602	2
AS54545	2
AS54606	4
AG56772	2
BB13081	2
301265	1
305521	1
AG72051	2
AS10601	22
AGTAG01	1

Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS07, 08 & 09
Description: END COLUMN BASE SECTION
Valmont #: 433459

A	02/07/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION

CBSB48333800261903812000G

WELD: AWS D1.1

valmont UTILITY

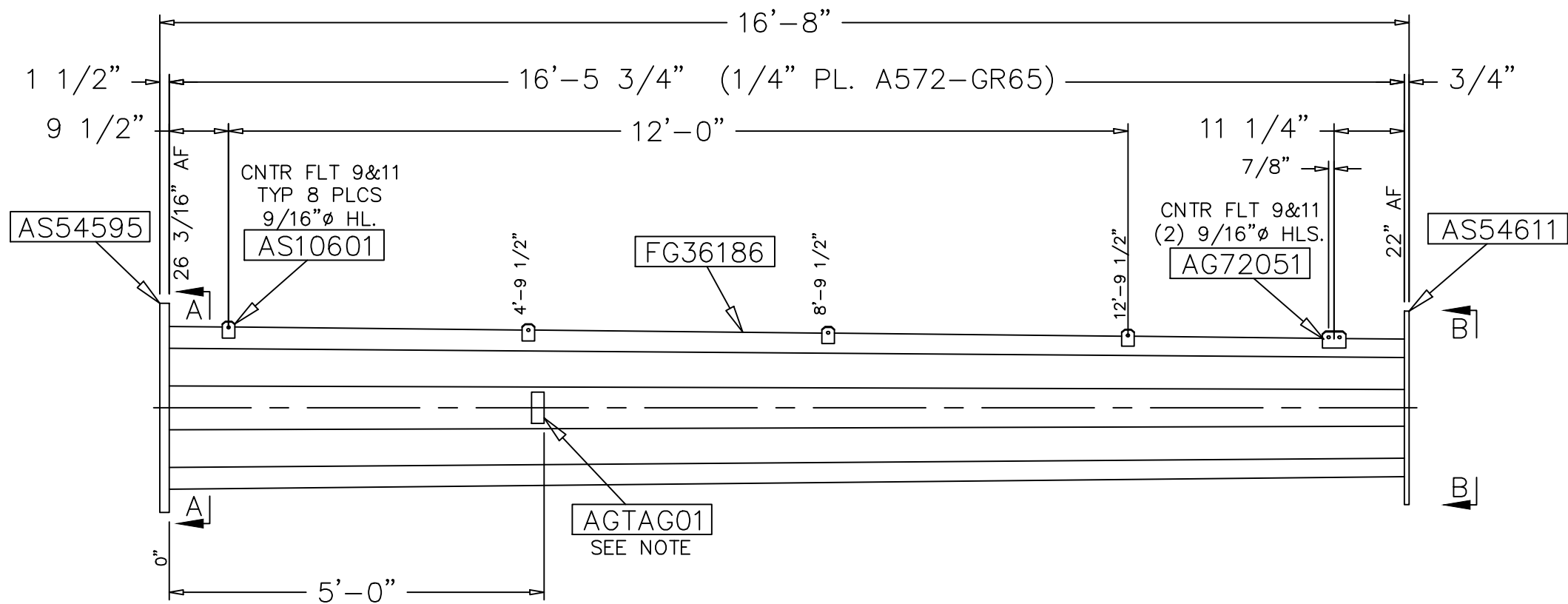
BGG811A

DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE
TOLERANCE 5001 THICK N/A	MATERIAL N/A	FINISH F1	WEIGHT 10088

BGG811B

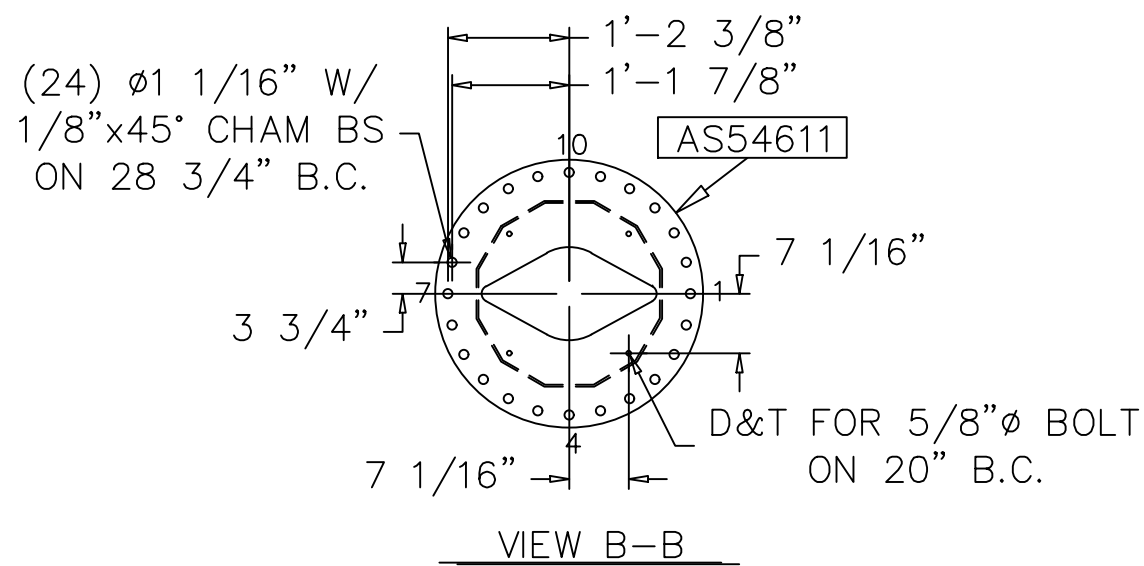
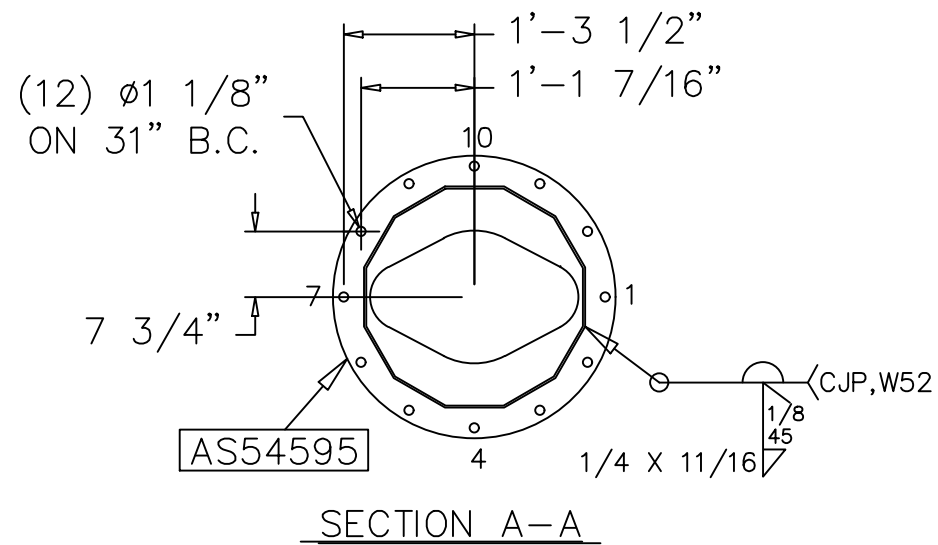
BILL OF MATERIAL

PART NUMBER	QTY.
FG36186	1
AS54595	1
AS54611	1
AS10601	8
AG72051	2
AGTAG01	1



ALL WELDS
UNLESS NOTED $\frac{3}{16}$

NOTE: STENCIL "BGG811B" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS07, 08 & 09
Description: UPPER COLUMN SECTION
Valmont #: 433459

REV	DATE	DESCRIPTION
		TOLERANCE 5001 THICK N/A MATERIAL N/A FINISH F1 WEIGHT 1823

ICSB16672619220002512000G

WELD: AWS D1.1

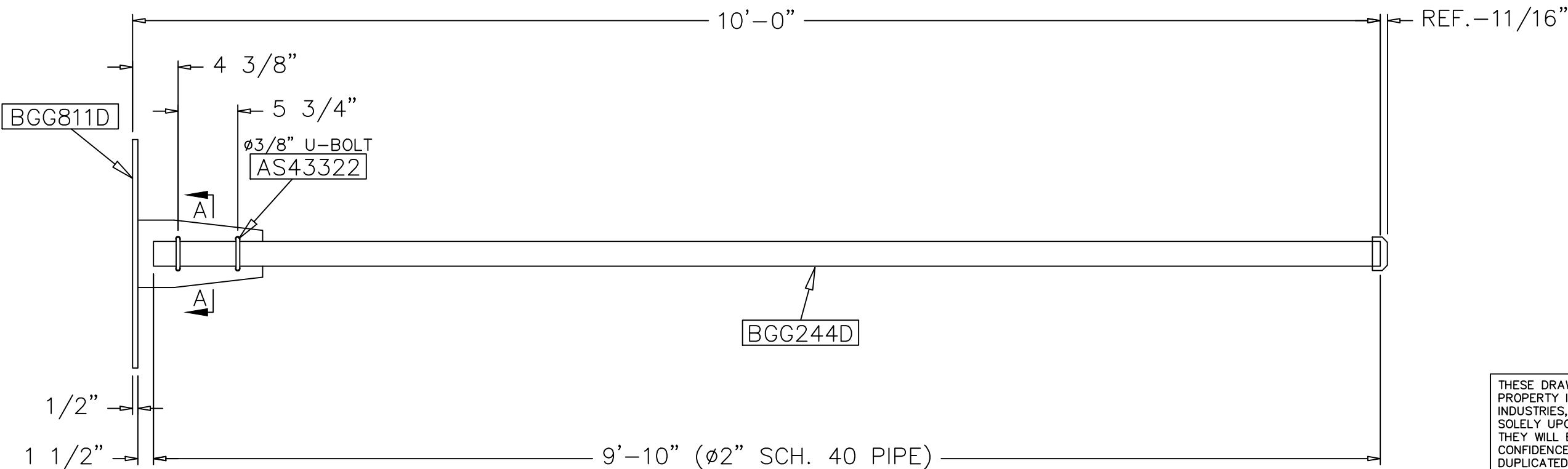
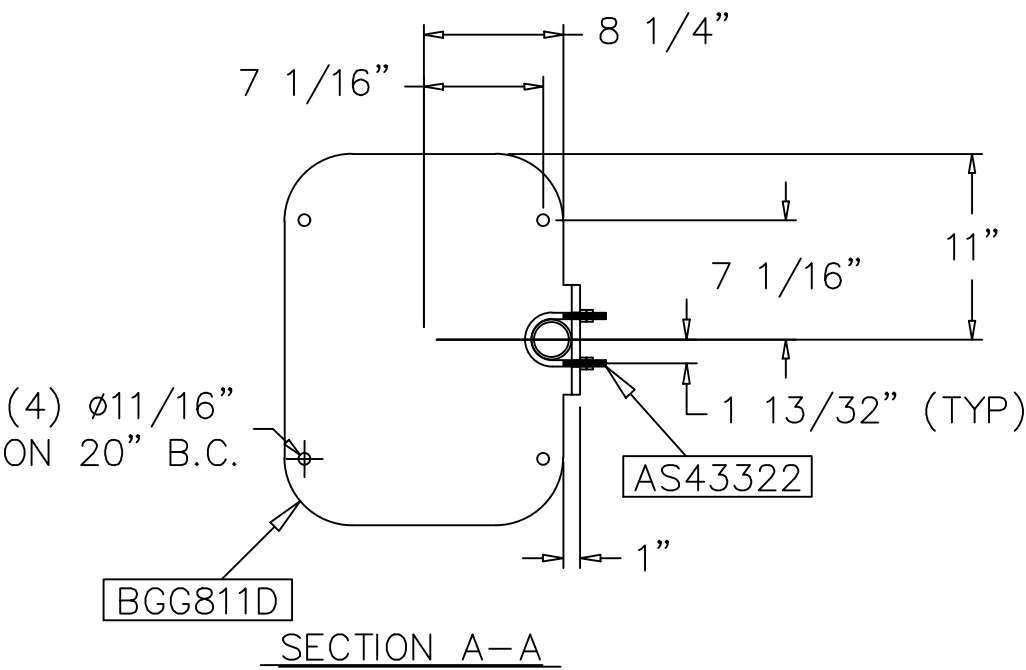
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE

BGG811B

BGG811C

BILL OF MATERIAL	
PART NUMBER	QTY.
BGG811D	1
BGG244D	1
AS43322	2

CUSTOMER NOTE: FIELD ASSEMBLE
COMPONENTS AS SHOWN



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Customer:
Substation:
P.O.#:
Item #: STANDARD
Description: SPIKE ASSEMBLY
Valmont #:

REV	DATE	DESCRIPTION
TOLERANCE	5001	THICK N/A

SPI10000200PPE ANGLE BRACKET 20" BC

DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE
MATERIAL N/A	FINISH F1	WEIGHT	104

valmont 
UTILITY
BGG811C

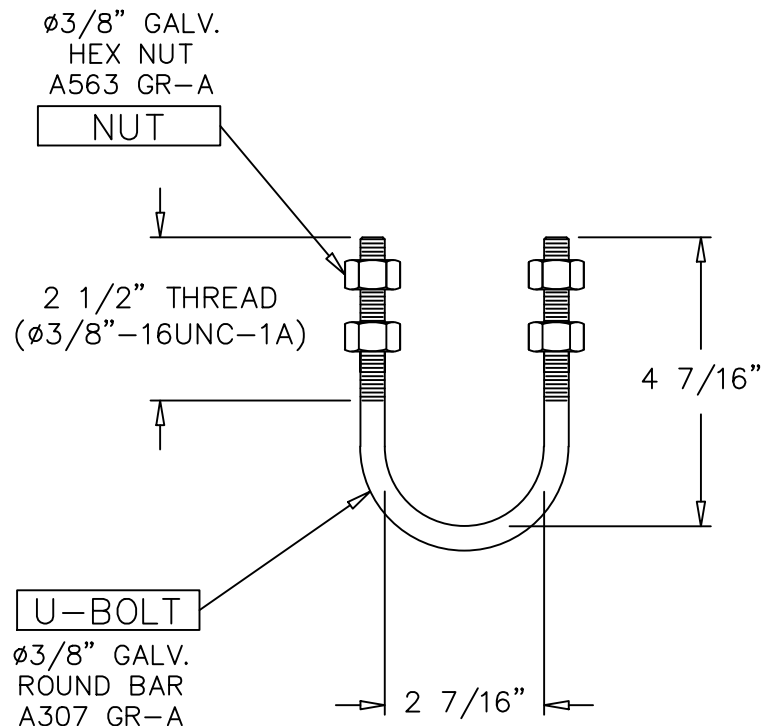


FASTENAL PART # 0156508

AS43322

BILL OF MATERIAL

PART NUMBER	QTY.
U-BOLT	1
NUT	4



GMF U-BOLT ø3/8" FOR ø2" SCH. 40 PIPE
RAW MATL PURCHASE

A	05/11/16	Approval Change JC106/JRJ3
REV	DATE	DESCRIPTION

TOLERANCE 5001 THICK 0.375 MATERIAL AS NTD. FINISH GALV. WEIGHT 2

valmont
NEWMARK

AS43322

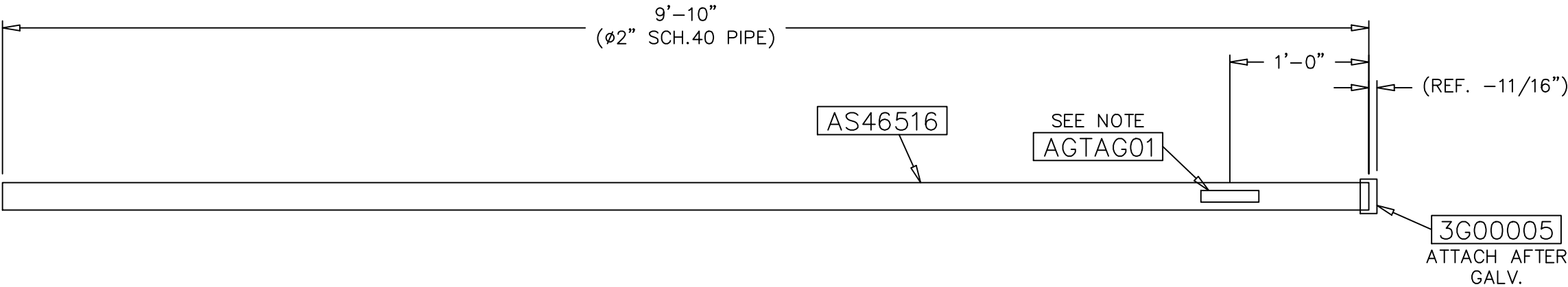
BGG244D

BILL OF MATERIAL

PART NUMBER	QTY.
AS46516	1
AGTAG01	1
3G00005	1

ALL WELDS
UNLESS NOTED $\frac{3}{16}$

NOTE: STENCIL "BGG244D" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



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Customer:
Substation:
P.O.#:
Item #: STANDARD 2"DIA X 10' LONG
Description: PIPE FOR SPIKE
Valmont #:

REV	DATE	DESCRIPTION
		TOLERANCE 5001 THICK N/A MATERIAL N/A

GMF — $\frac{\phi 2}{5}$ — X $\frac{9'-10''}{10}$ — PIPE FOR SPIKE

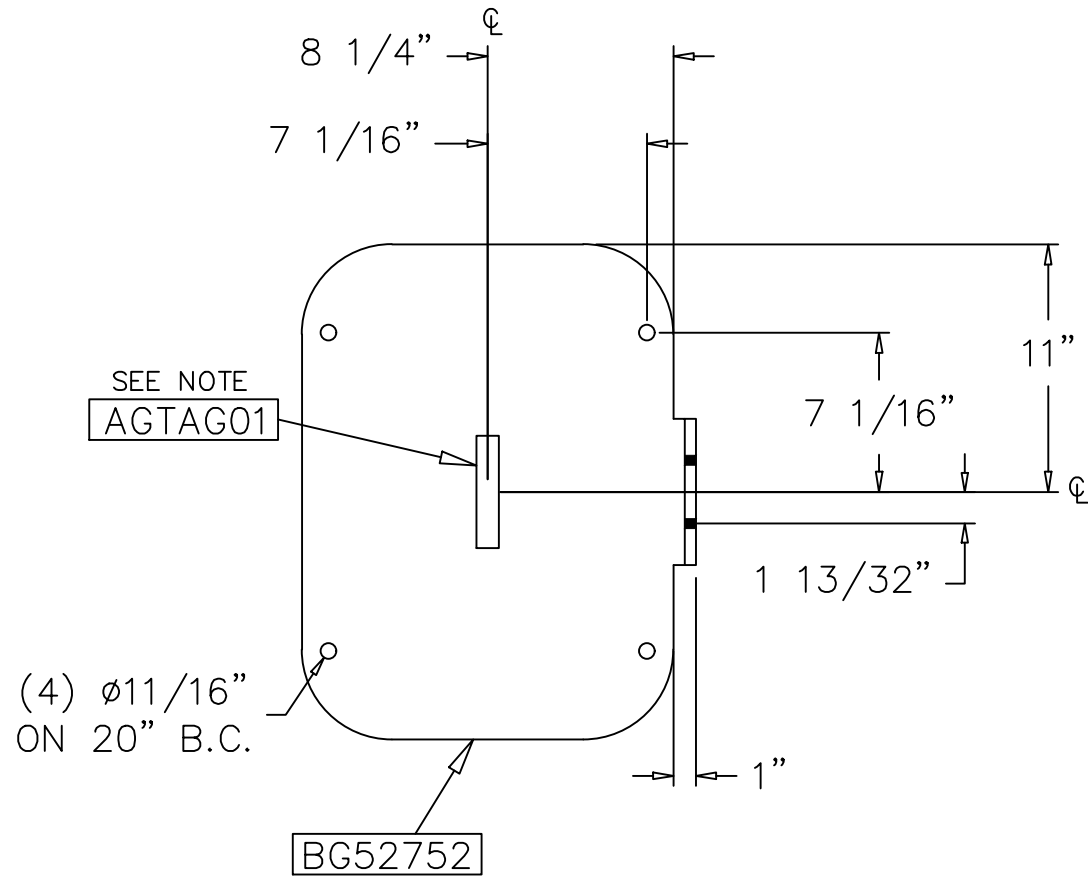
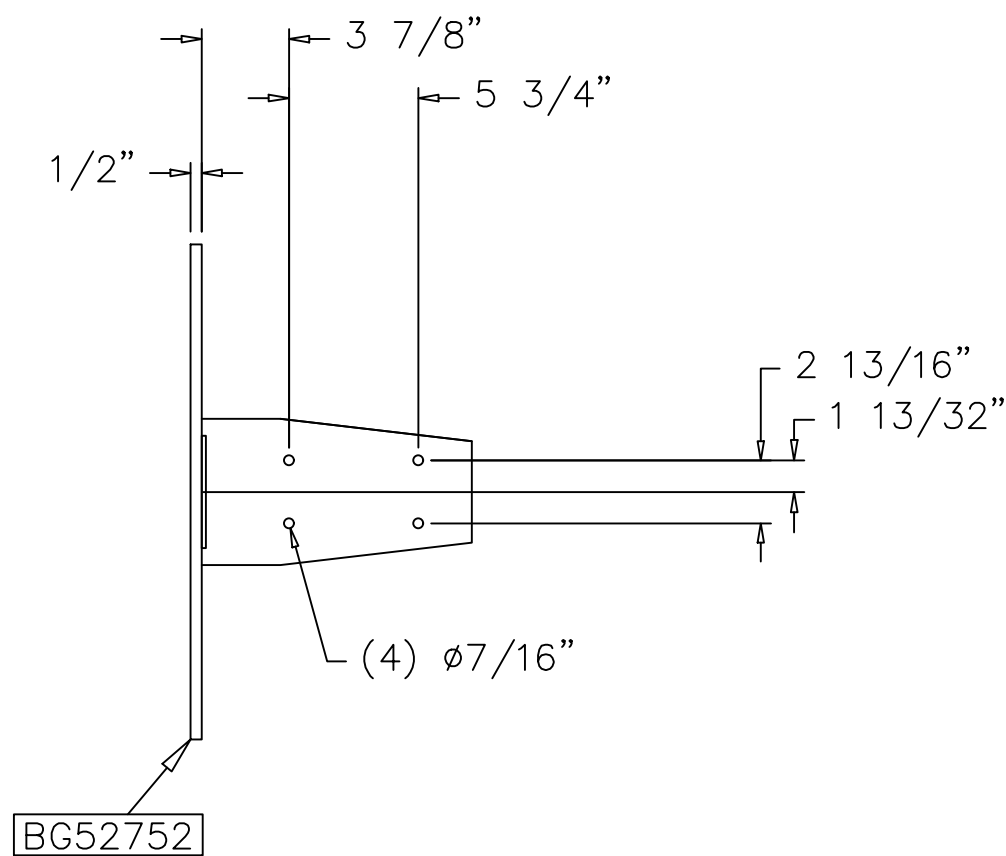
WELD: AWS D1.1

DRAWN	CHECKED	DATE	SCALE
BR01	JHU1	05-01-17	NONE
FINISH F1		WEIGHT 38	

BGG244D

BGG811D

BILL OF MATERIAL	
PART NUMBER	QTY.
BG52752	1
AGTAG01	1



NOTE: STENCIL "BGG811D" ON TAG AGTAG01 IN 1/2" HIGH LETTERS

ALL WELDS UNLESS NOTED 3/16"

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Customer:
Substation:
P.O.#:
Item #:
Description: SPIKE BRACKET
Valmont #:

REV	DATE	DESCRIPTION
TOLERANCE 5001		THICK N/A

GMF — BENT PLATE FOR SPIKE

WELD: AWS D1.1

DRAWN
KLK2

CHECKED
KLK2

DATE
01-29-19

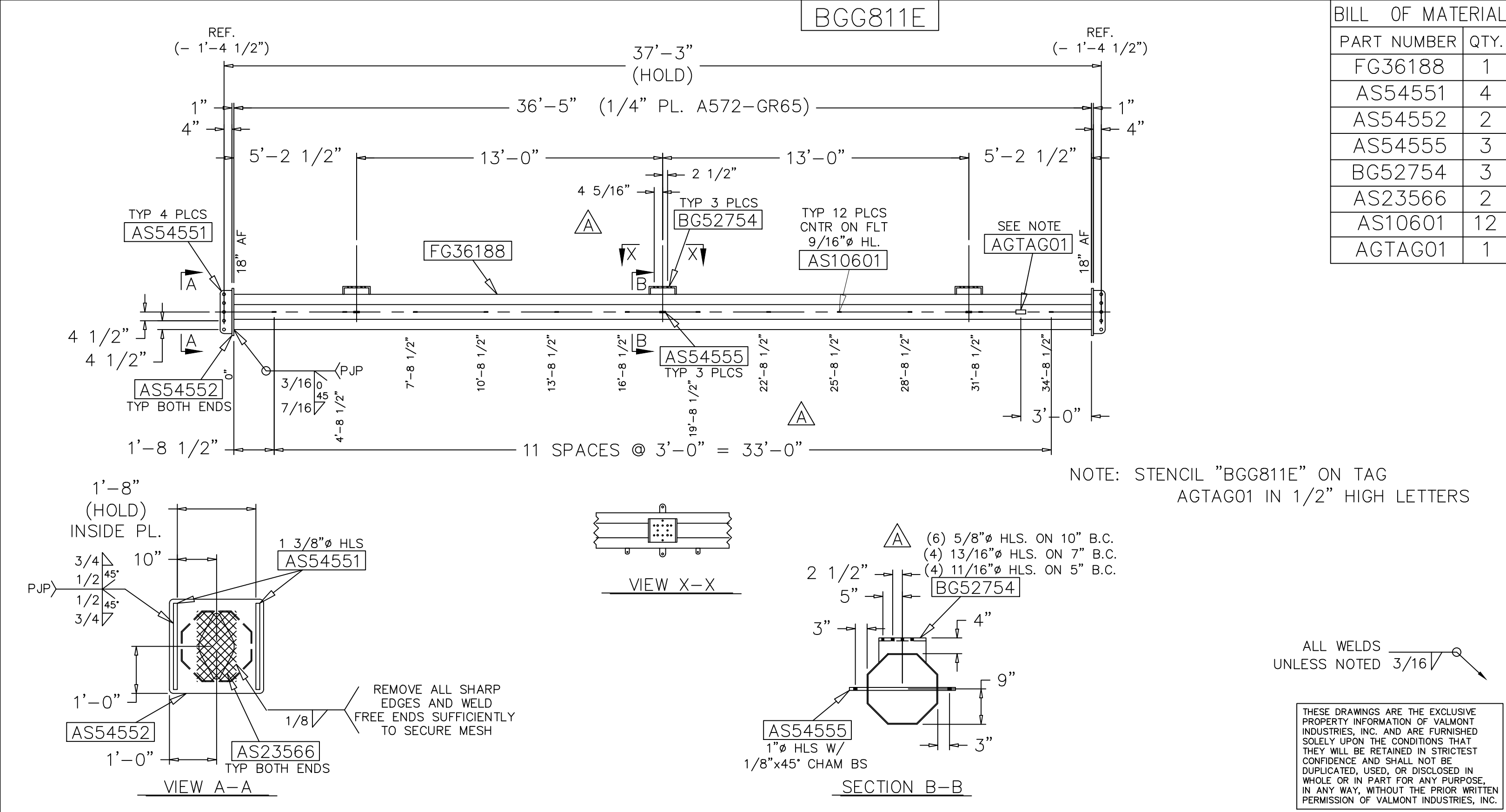
SCALE
NONE

MATERIAL N/A

FINISH F1

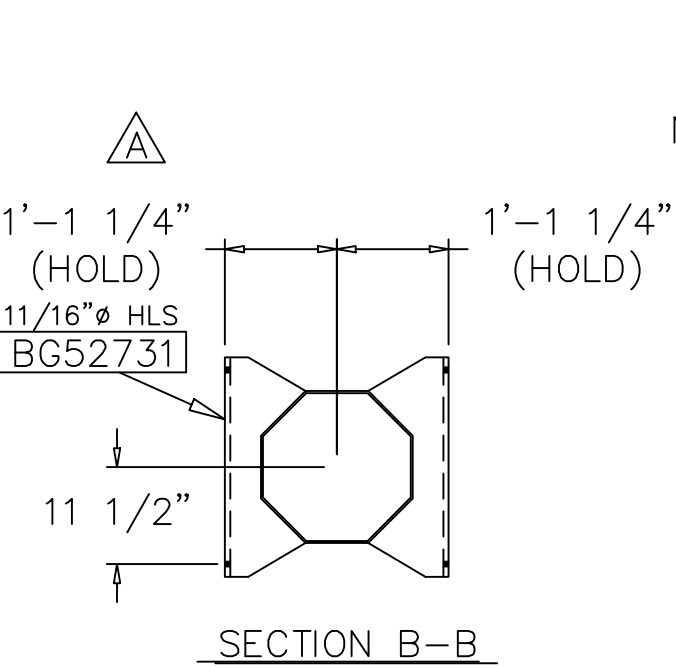
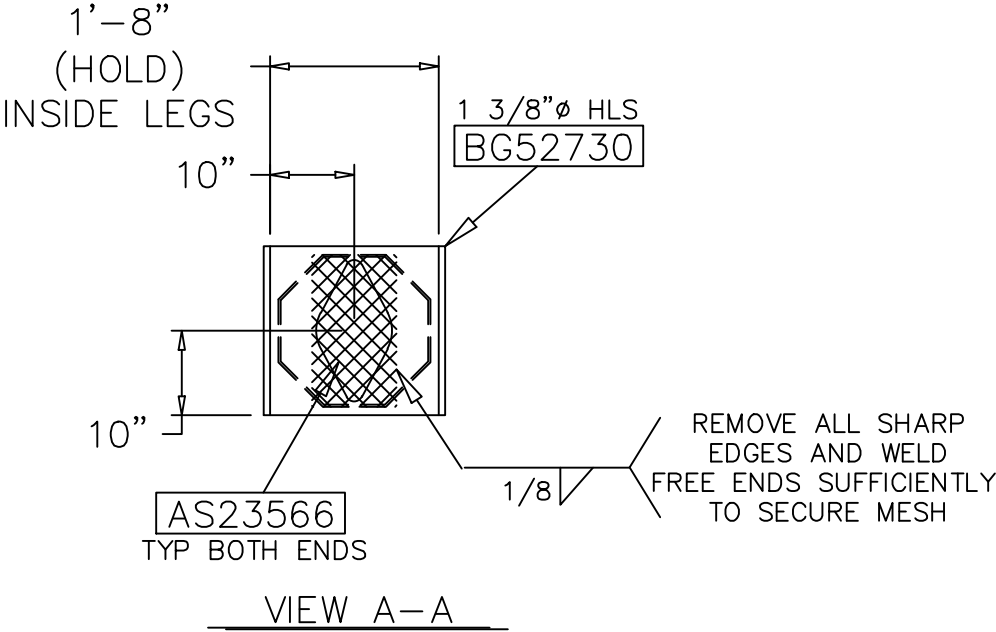
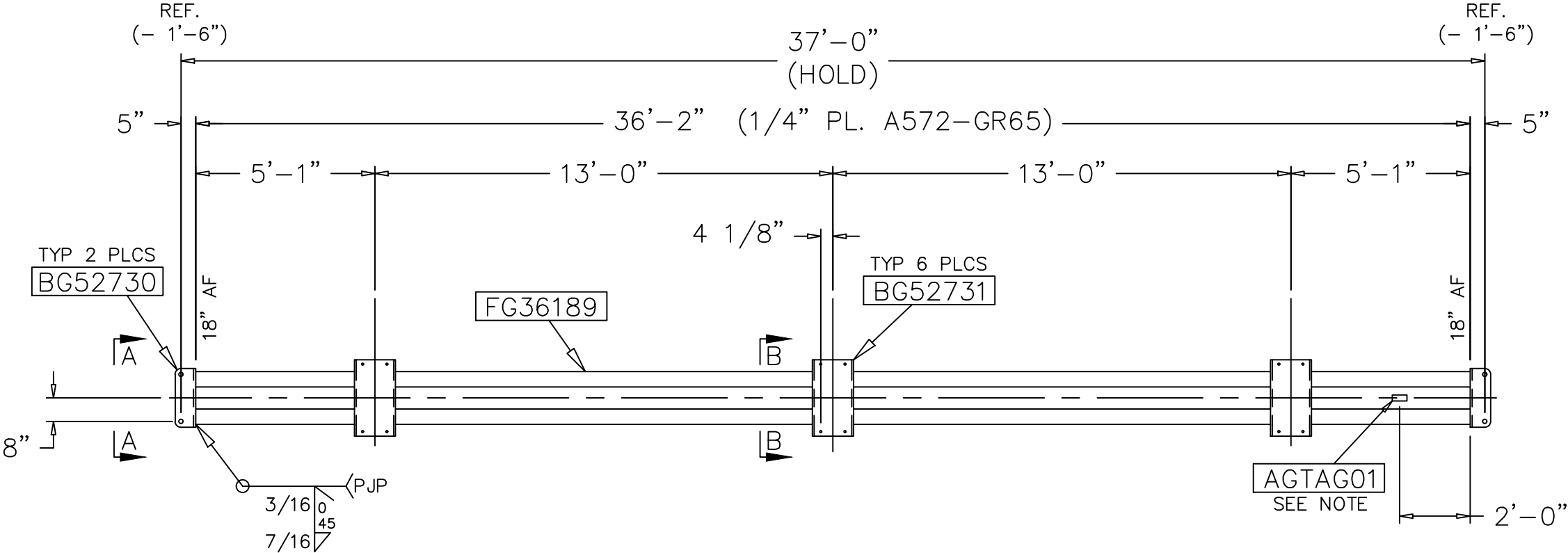
WEIGHT 62

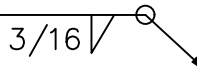
BGG811D



BGG811F

BILL OF MATERIAL	
PART NUMBER	QTY.
FG36189	1
BG52730	2
BG52731	6
AS23566	2
AGTAG01	1



ALL WELDS UNLESS NOTED 3/16" 

NOTE: STENCIL "BGG811F" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS07, 08 & 09
Description: SWITCH BEAM
Valmont #: 433459

A	02/25/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
TOLERANCE 5001 THICK N/A MATERIAL N/A		

BFEA180025037001300G

5101520253035

WELD: AWS D1.1

valmont

UTILITY

DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE
FINISH F1		WEIGHT 3058	

BGG811F

BGG812Z

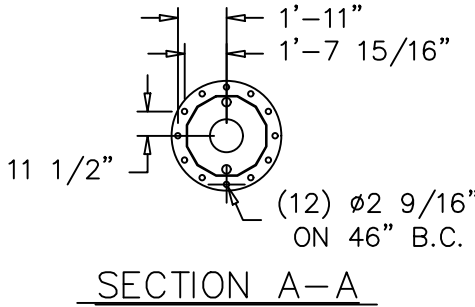
TOTAL HARDWARE QUANTITIES TO INCLUDE AN
EXTRA 5 PERCENT OVERAGE

BILL OF MATERIAL
(SHIPPING SEQ. = 1 FOR ALL)

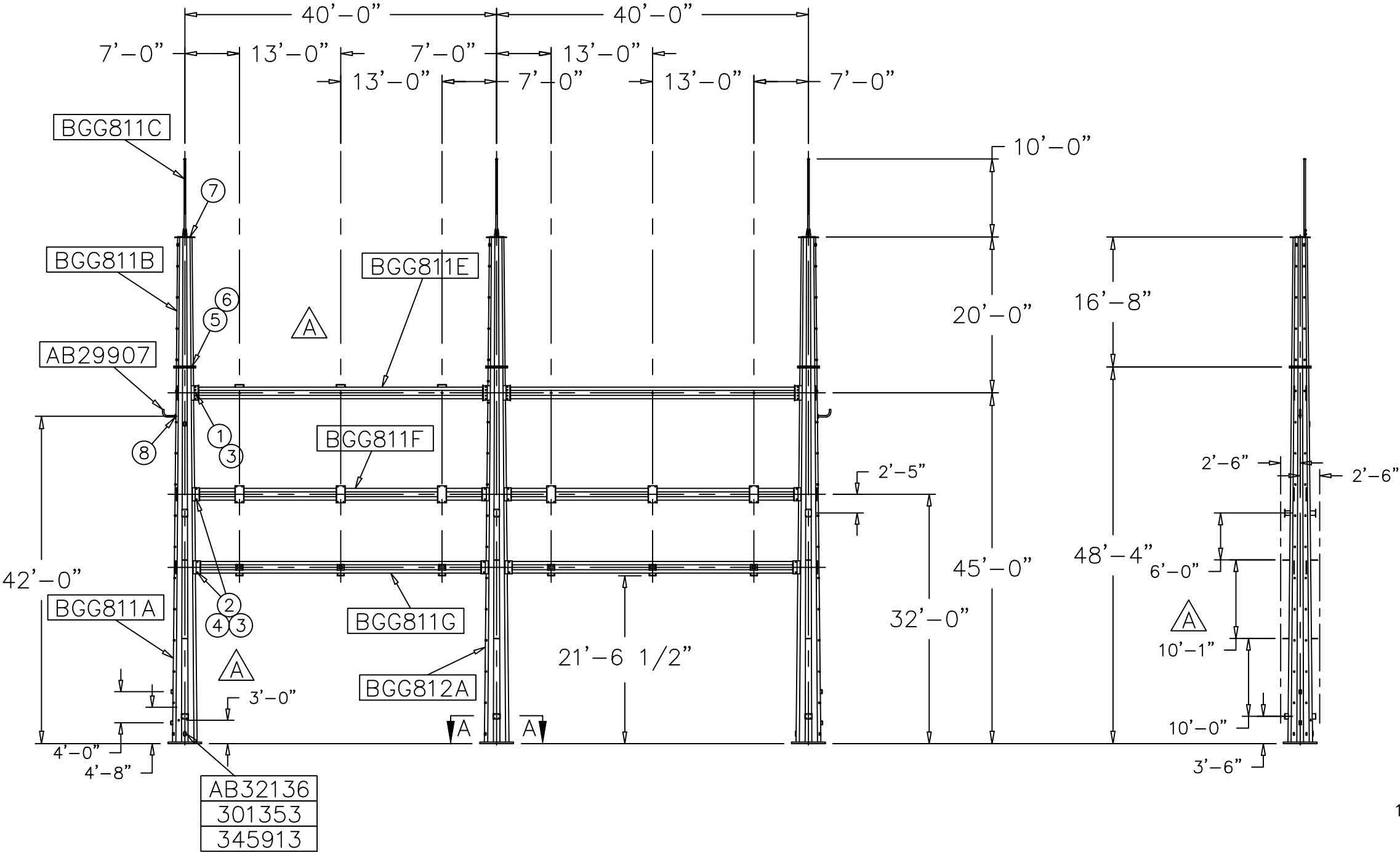
PART NUMBER	DESCRIPTION	UNIT WEIGHT	QTY PER STR.
BGG811A	END COLUMN BASE SECTION	10088	2
BGG812A	MIDDLE COLUMN BASE SECTION	10262	1
BGG811B	UPPER COLUMN SECTION	1823	3
BGG811C	SPIKE ASSEMBLY	104	3
BGG811E	CONDUCTOR BEAM	2583	2
BGG811F	SWITCH BEAM	3058	2
BGG811G	INSULATOR BEAM	2406	2
AB29907	LIGHT MOUNTING ARM	10	2
AB32136	HAND HOLE COVER	1	4
301353	COVER MOUNTING BAR		4
345913	COVER MOUNTING SCREW		4
AS54630	HARDWARE KIT		1

DESCRIPTION

LINE	PART NUMBER	HARDWARE SIZE				GENERAL	FINISH	ASTM SPEC	QTY
		TYPE	DIA.	LENGTH	THREAD LENGTH				
1	169198	BOLT	1.25	4.00	2.00		HDGV	A325	42
2	169199	BOLT	1.25	3.75	2.00		HDGV	A325	34
3	133024	NUT	1.25			DH,LOCK	HDGV	A563	76
4	142086	WSHR	1.25			CS,FLAT	HDGV	F436	34
5	1004421	BOLT	1.00	4.50	1.75		HDGV	A325	38
6	131188	NUT	1.00			DH,LOCK	HDGV	A563	38
7	161147	BOLT	0.63	1.50	1.25		HDGV	A325	13
8	161820	BOLT	0.50	1.50	1.50		HDGV	A307	3



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS08
Description: 161KV 2-BAY H-FRAME DEADEND
Valmont #: 433459

A	02/07/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION

HFA16145002000000000000400002

WELD: AWS D1.1

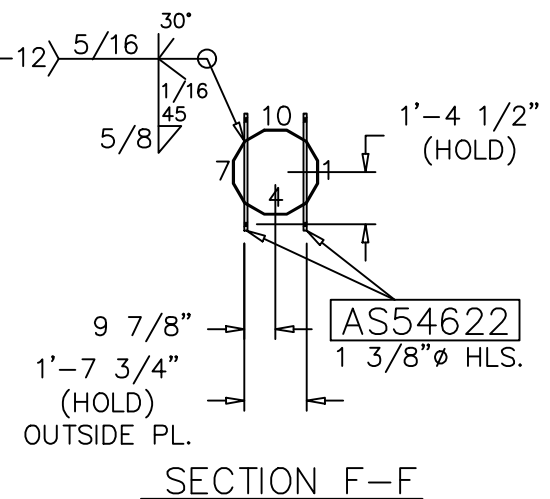
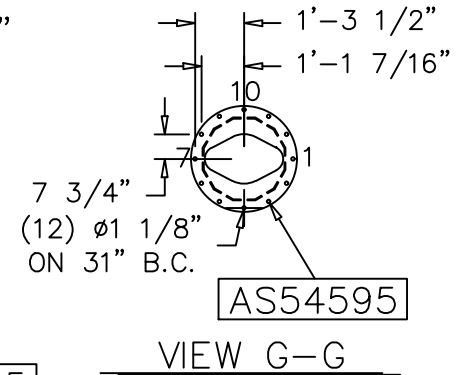
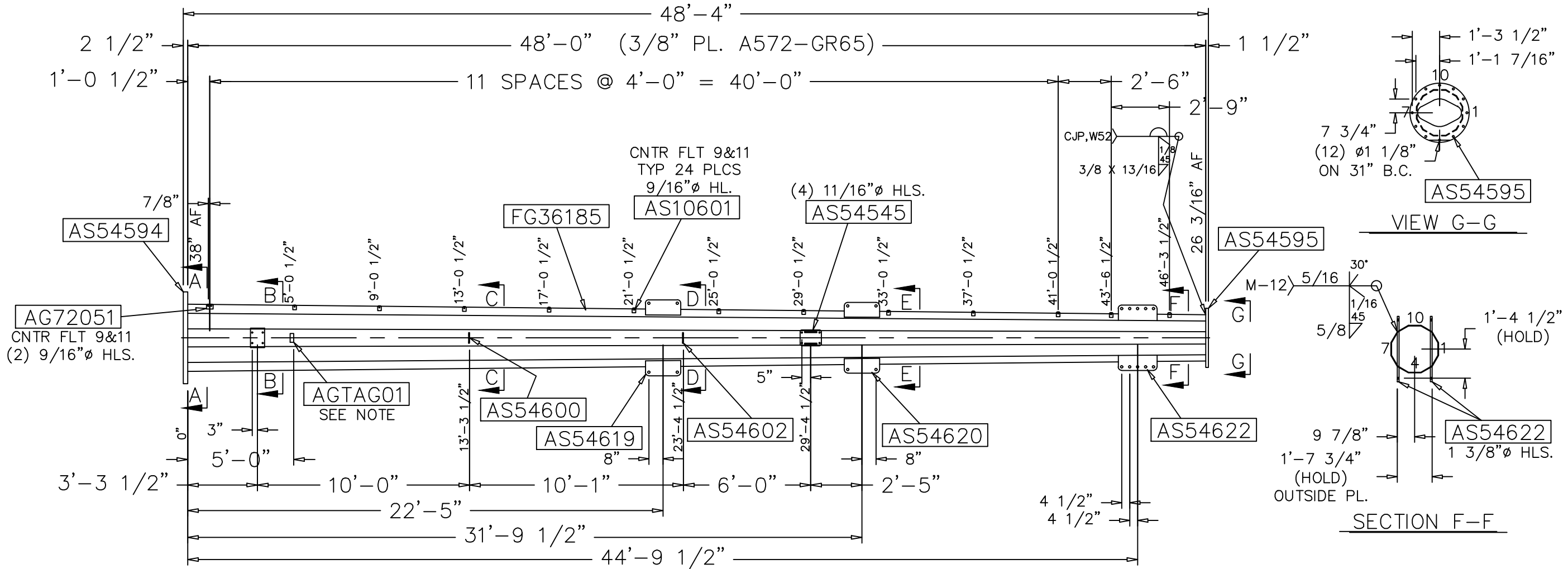
DRAWN	CHECKED	DATE	SCALE
KLK2	KLK2	01-29-19	NONE
TOLERANCE 5001	THICK N/A	MATERIAL N/A	FINISH F1
		WEIGHT 52339	

valmont UTILITY

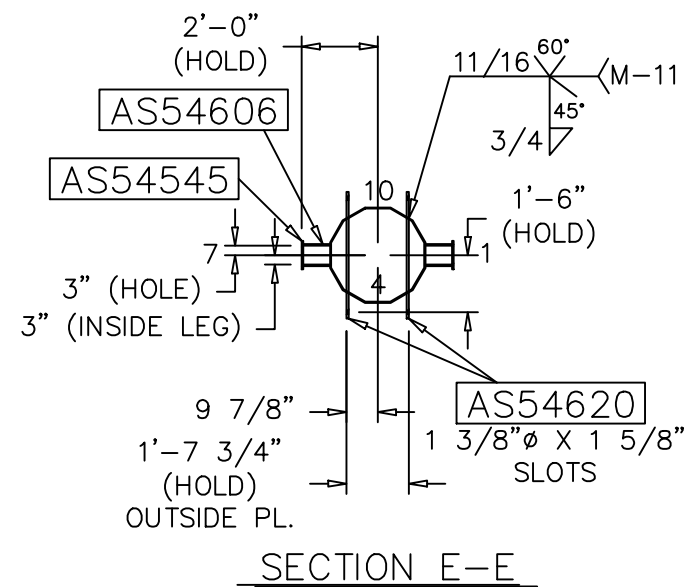
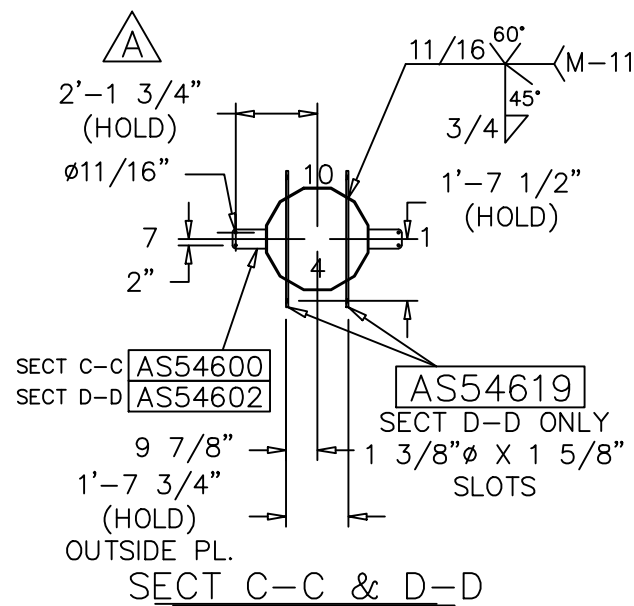
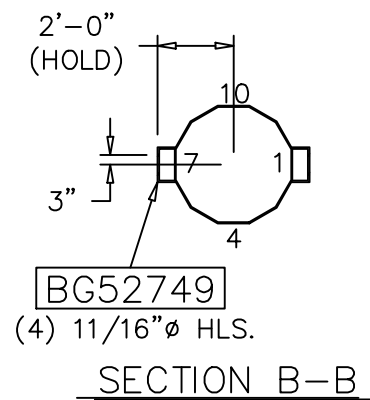
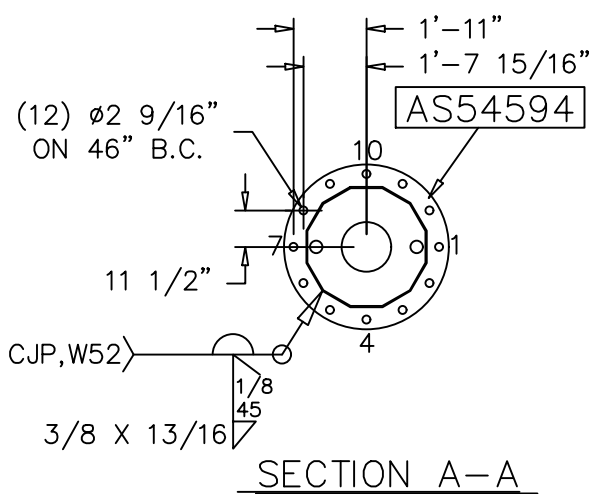
BGG812Z

BGG812A

BILL OF MATERIAL	
PART NUMBER	QTY.
FG36185	1
AS54594	1
AS54595	1
AS54619	2
AS54620	2
AS54622	2
BG52749	2
AS54600	2
AS54602	2
AS54545	2
AS54606	4
AG72051	2
AS10601	24
AGTAG01	1



NOTE: STENCIL "BGG812A" ON TAG
AGTAG01 IN 1/2" HIGH LETTERS



ALL WELDS
UNLESS NOTED 3/16"

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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS08 & 09
Description: MIDDLE COLUMN BASE SECTION
Valmont #: 433459

A	02/07/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
		TOLERANCE 5001 THICK N/A MATERIAL N/A FINISH F1 WEIGHT 10262

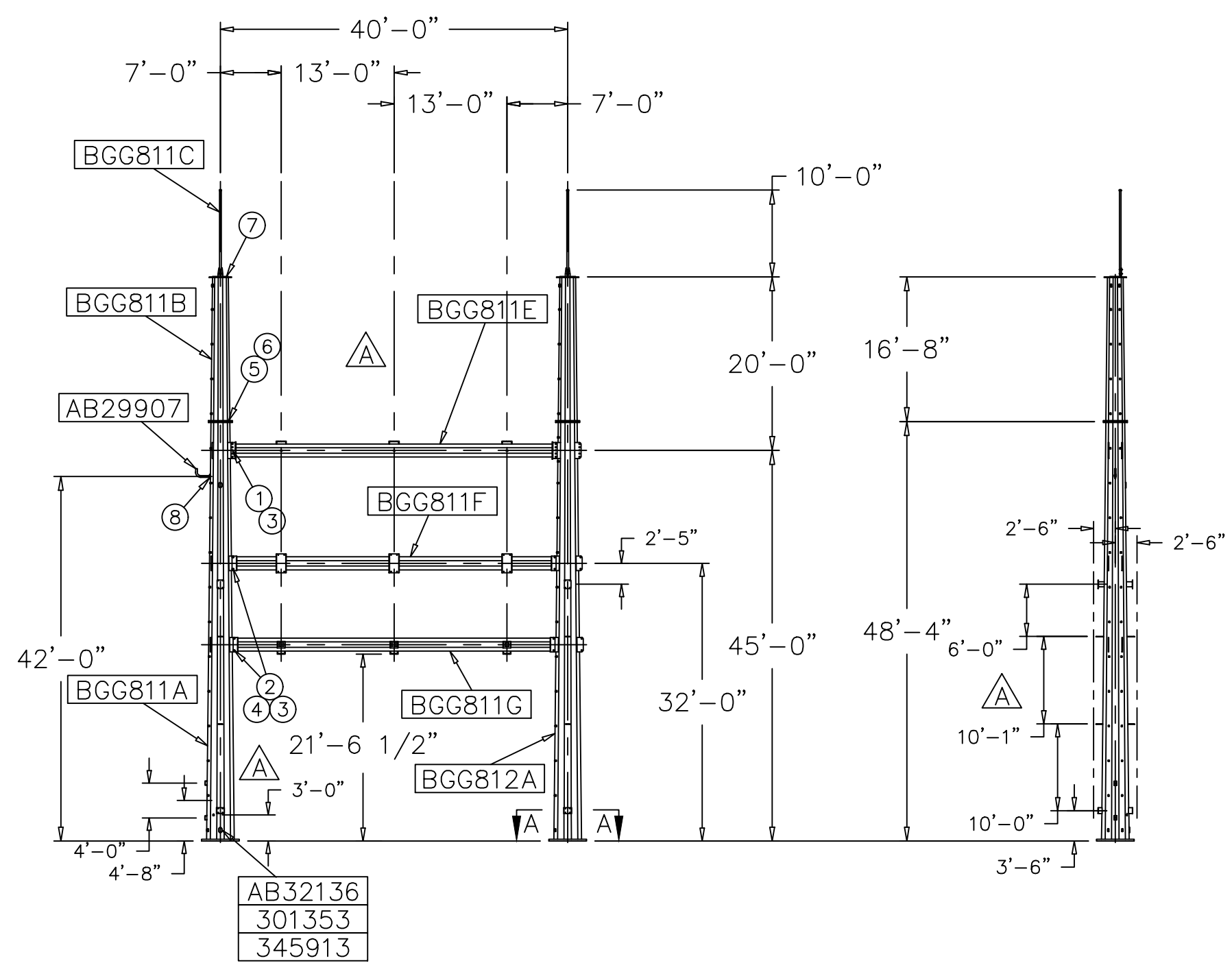
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WELD: AWS D1.1

valmont
UTILITY

BGG812A

BGG813Z

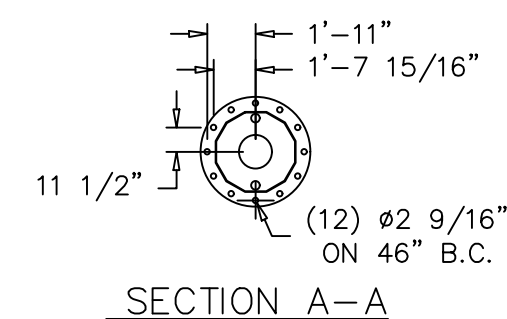


TOTAL HARDWARE QUANTITIES TO INCLUDE AN
EXTRA 5 PERCENT OVERAGE

BILL OF MATERIAL
(SHIPPING SEQ. = 1 FOR ALL)

PART NUMBER	DESCRIPTION	UNIT WEIGHT	QTY PER STR.
BGG811A	END COLUMN BASE SECTION	10088	1
BGG812A	MIDDLE COLUMN BASE SECTION	10262	1
BGG811B	UPPER COLUMN SECTION	1823	2
BGG811C	SPIKE ASSEMBLY	104	2
BGG811E	CONDUCTOR BEAM	2583	1
BGG811F	SWITCH BEAM	3058	1
BGG811G	INSULATOR BEAM	2406	1
AB29907	LIGHT MOUNTING ARM	10	1
AB32136	HAND HOLE COVER	1	2
301353	COVER MOUNTING BAR		2
345913	COVER MOUNTING SCREW		2
AS54632	HARDWARE KIT		1

DESCRIPTION									
LINE	PART NUMBER	HARDWARE SIZE				GENERAL	FINISH	ASTM SPEC	QTY
		TYPE	DIA.	LENGTH	THREAD LENGTH				
1	169198	BOLT	1.25	4.00	2.00		HDGV	A325	21
2	169199	BOLT	1.25	3.75	2.00		HDGV	A325	17
3	133024	NUT	1.25			DH,LOCK	HDGV	A563	38
4	142086	WSHR	1.25			CS,FLAT	HDGV	F436	17
5	1004421	BOLT	1.00	4.50	1.75		HDGV	A325	25
6	131188	NUT	1.00			DH,LOCK	HDGV	A563	25
7	161147	BOLT	0.63	1.50	1.25		HDGV	A325	9
8	161820	BOLT	0.50	1.50	1.50		HDGV	A307	2



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Customer: GRDA
Substation: IGLOO VALLEY INTERCONNECT S121
P.O.#: 42541
Item #: 907SPS08
Description: 161KV H-FRAME DEADEND EXPANDABLE
Valmont #: 433459

A	02/07/19	Approval Change KLK2/KLK2
REV	DATE	DESCRIPTION
		TOLERANCE 5001 THICK N/A MATERIAL N/A

HFA16145002000000000000400001

WELD: AWS D1.1

DRAWN
KLK2

CHECKED
KLK2

DATE
01-29-19

SCALE
NONE

valmont UTILITY

BGG813Z

WEIGHT 32264

Grand River Dam Authority Igloo Valley Interconnect Substation & 3500 Main Switching Station

The design information included with this proposal is preliminary in nature and may be refined after the award of an order. Valmont's intent is to meet the inquiry specification with the following engineering comments. Please review these, along with the design information enclosed, to assure that we have correctly interpreted the inquiry requirements.

COMMENTS AND PENDING INFORMATION

The design criteria for some of the load cases was unclear. Customer to review and verify the load cases used, shown below, are acceptable or provide clarification.

Load Cases

No.	Description	Wind Pressure (psf)	Wind Angle (deg)	Wire/Equip Ice Thickness (in)	Wind OLF	Tension OLF	Weight OLF	Defl. Limit	Defl. Limit Mode
1	1 NESC Heavy	4.00	90.00	0.50	2.50	1.65	1.50	0.00 Dim.	▼
2	2 Extreme Wind	36.70	90.00	0.00	1.10	1.10	1.10	0.00 Dim.	▼
3	3 Extreme Ice	0.00	90.00	1.25	1.10	1.10	1.10	0.00 Dim.	▼
4	4 Ice and Wind	5.87	90.00	1.00	1.00	1.00	1.00	0.00 Dim.	▼
5	5 Deflection	23.50	90.00	0.00	1.00	1.00	1.00	1.00 % Ht.	▼
6	6 Construction	0.00	90.00	0.00	1.00	1.00	1.00	0.00 Dim.	▼

DESIGN

Base plate to foundation clearance of up to 2xBolt Diameter is acceptable without grouting or additional calculations (ref. ASCE guidelines).

Design is based on the following publications:

- ASCE/SEI 48-05, "Design of Steel Transmission Pole Structures"
- ASCE 113, "Substation Structure Design Guide"
- ACI 318 (as referenced in the above publications)
 - $f'_c=4,000$ psi

The designs presented have been completed by a trained structural engineer under the direct supervision of a professional engineer licensed in the state of Oklahoma. **Required stamping of drawings will reflect Oklahoma registration. If stamping needs to reflect another state (or territory) a fee will be charged for the services of a third party engineer.** Project scheduling must reflect the additional time for stamping because we require approval and stamping of calculations and drawings to occur before manufacturing begins.

Welds will be sized based on the applied loads and may not develop the full strength of any of the components.

Our design calculations are based on static loads. Wind induced vibration is believed to be more likely to happen when structures (or components such as arms) are installed without insulators and conductors. It is considered good practice for installers to attach at least some equipment to each arm at the time of installation of the structure. See I002 attached.

We know of no way to prove that local buckling cannot occur in a connection. We do know, through testing, that the connection we will provide will reliably carry all design loads. Local buckling, if it occurs, will be induced by loads in excess of the design loads.

MATERIAL

Stainless ground plates will be provided in-lieu of copper ground plates.

Bolts, nuts and washers may be of **foreign origin**.

Connection bolts, other than anchor bolts, will not have guaranteed Charpy values.

The following **materials** will be used:

shaft and attachment plate: (Galvanized or Painted)

thk $\leq$ 0.5" Valmont S-22 (exceeds ASTM A572, Gr 65, Heat test)

thk $\leq$ 0.5" Valmont S-70 (exceeds ASTM A36)

0.5" < thk $\leq$ 1.25 Valmont S-25 (exceeds ASTM A572, Gr 65, Plate test)

1.25" < thk Valmont S-56 (exceeds ASTM A572, Gr 50, Heat test)

pipe/tubing: Valmont S-146 (Galvanized or Painted) (no guaranteed Charpy)

structural shapes: ASTM A36 (no guaranteed Charpy)

anchor bolts: Valmont S-23 (exceeds ASTM A615 Gr. 75)

connection bolts: ASTM A325

nuts/washers: matching the bolts used

ANCO type locknuts are provided for connection bolts other than anchorage

FABRICATION

Base plate holes will be burned using a mechanically guided torch.

Bolt holes will be 0.13" larger than the nominal bolt diameter, except for anchor bolt holes in base plates which will be 2.63" in diameter.

Caged anchor bolts will be provided as shown in the attached sketch. Note that the bottom template is welded to the anchor bolt at a point below the required bond length.

A drilled and tapped pad shall be used as an alternate to less than 0.5" grounding nuts.

Pole caps may project up to three inches from the pole shaft.

Identification markings will be stamped into plates welded to the components.

Prefitting of components or match-marking is not included in our proposal. The fabrication tolerances and detailing practices used assure fit as well as interchangeability. *Our standard method for identifying sections assures correct section orientation and provides a reference point for measure of slip distance.*

Slip joint tolerance: $+6" - (1.872/\text{Taper} + K)$

where: $\text{Taper} = \text{diameter change per foot of length (in/ft)}$
 $K = 9.9 - 0.082(D/t)$
 $D = \text{top diameter of male section (inches)}$
 $t = \text{thickness of male section (inches)}$

Tolerances for fabrication shall meet Valmont's specification(s).

Welding and weld inspection will be performed in accordance with Valmont's specification(s).

Weld joint details will have either the prequalified or qualified joint status in accordance with the AWS D1.1 code.

Attachment vangs will extend thru the pole shaft eliminating the need for doubler or reinforcing plates.

Vang-to-pole shaft welds will be fillet or partial penetration groove welds (with or without a fillet overlay) sized for the strength requirements of the joint. These welds are qualified in accordance with AWS D1.1.

The arm-to-bracket weld has been standardized as a partial penetration groove weld with fillet overlay sized to develop the full strength of the arm section. This weld detail is fully inspectable per AWS acceptance criteria and develops the full strength of the arm while maintaining thru-thickness stress levels per ASCE allowables.

FINISH SPECIFICATIONS

Hot-dip Galvanizing of Members per Valmont Specification F-1 (exceeds ASTM A123).

Hot-dip Galvanizing of Hardware per Valmont Specification F-2 (ASTM A153).

SSPC SP8 surface preparation will precede galvanizing. Exposed welds will be mechanically cleaned.

A maximum galvanizing thickness will not be guaranteed.

INSPECTION

Base plate material shall be ultrasonically inspected per ASTM A435 and Valmont WP 10.04

Certified test reports are obtained from our suppliers for:

1. structural steel plates and shapes
2. connecting hardware
3. welding electrodes and flux
4. rebar used for anchor bolts

Formed plates will be visually inspected for cracking. Magnetic particle inspection will supplement the visual inspection in questionable areas.

Inspection records in the form of "Traveler Cards" will follow the components through the fabrication process.

The third part inspection agency should be approved by Valmont.

Systems are in place that will provide the following levels of test report traceability:

1. direct, one-to-one traceability to pole shafts and base plates
2. batch to other structural components

The test reports and inspection records are maintained at Valmont. When requested, these can be provided to the customer no sooner than two weeks after the fabrication of the component.

We recommend the **turn-of-nut tightening method** explained in the AISC Steel Construction Manual specification. Torque values for bolts will not be provided.

DRAWINGS/CALCULATIONS

Preliminary drawings showing standard features and options are included with proposal.

Final designs and drawings will be submitted on a schedule determined by the required shipping dates.

Valmont standard drawings and details shall be supplied and shall include the following information:

1. - erection drawings, will include the following:
 - total structure weight
 - arm connection detail. no bolt details / layouts
 - referenced major components and loose hardware bill of material.
2. - section assembly drawings will include all integral parts of the section.
3. - subassembly drawings: i.e. arm assemblies with all integral parts.

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FOR APPROVAL



Valmont Industries, Inc.
7002 North 288th St.
P.O. Box 358
Valley, Nebraska 68064-0358 USA
(402) 359-2201

Transmission Structure Calculations
for
GRAND RIVER DAM AUTHORITY
3500 Main Substation (S907)
Valmont Order #433459

Thursday, 03 January 2019

Prepared By:
Design Engineer
Raul Ortiz Jr., P.E.
Raul.Ortiz@Valmont.com

Proprietary Information

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Valmont Industries, Inc.
7002 North 288th St.
P.O. Box 358
Valley, Nebraska 68064-0358 USA
(402) 359-2201

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APPENDIX A - Engineering Design Sketches

APPENDIX B - Customer Provided Information

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Valmont Industries, Inc.

Project Summary

GRAND RIVER DAM AUTHORITY
3500 Main Substation (S907)
433459

Structure Identifier	Pole Height (ft)	Emb. Length (ft)	Anchor Bolts			Shaft Diameters			Weight (lb)								Global Base Reactions For Pole Shaft Governing Load Case				
			Max Bolt Circle (in)	Anchor Bolt Length (in)	Qty	Base (in)	Ground Line (in)	Top (in)	Sect A	Sect B	Sect C	Sect D	Sect E	Sect F	Base Plate	Anchor Bolts	Load Case Identifier	Moment (in-kip)	Shear (kip)	Axial (kip)	Max Defl (in)
Item_35	65.00	----	46.00	84	12	38.00	38.00	22.00	6247	1109	----	----	----	----	1110	1580	1LC1	14357	26.6	31.7	14
Item_36	65.00	----	46.00	84	12	38.00	38.00	22.00	6247	1109	----	----	----	----	1110	1580	1LC1	22382	43.9	46.2	20

Valmont Industries, Inc.

Project Summary

GRAND RIVER DAM AUTHORITY
3500 Main Substation (S907)
433459

Structure Identifier	Shaft Yield Stress (ksi)	Shaft Taper (in/ft)	Shaft Shape	Anchor Bolt Diameter (in)	Base Plate Width/ Length (in)	Base Plate Thickness (in)	Camber (in)	Length (ft)						Thickness (in)					
								Sect A	Sect B	Sect C	Sect D	Sect E	Sect F	Sect A	Sect B	Sect C	Sect D	Sect E	Sect F
Item_35	65	0.246	12	2.25	52.00	2.50	0.0	48.00	17.00	---	---	---	---	0.375	0.250	---	---	---	---
Item_36	65	0.246	12	2.25	52.00	2.50	0.0	48.00	17.00	---	---	---	---	0.375	0.250	---	---	---	---

Valmont Industries, Inc.

Project Summary

GRAND RIVER DAM AUTHORITY
3500 Main Subsation (S907)
433459

Structure Identifier	Section Data																
	"A"	"A"	"B"	"B"	"C"	"C"	"D"	"D"	"E"	"E"	"F"	"F"	"A"-"B"	"B"-"C"	"C"-"D"	"D"-"E"	"E"-"F"
	Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Joint	Joint	Joint	Joint	Joint
	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Diameter	Type	Type	Type	Type	Type
	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)					
Item_35	38.00	26.18	26.19	22.00	----	----	----	----	----	----	----	----	Flange		----	----	----
Item_36	38.00	26.18	26.19	22.00	----	----	----	----	----	----	----	----	Flange		----	----	----

----- Multi Pole Leg Configuration -----

Pole Design	Pole Instance	Above Ground Height (ft)	X (ft)	Ground Line Y (ft)	Z (ft)
Item_35	Left	65.00	-20.00	0.00	0.00
Item_35	Center	65.00	20.00	0.00	0.00

----- Multi Pole Arm Instance Configuration -----

Arm Number	Arm Label	Base End Mounted to	Base End Connection	Tip End Mounted to	Tip End Connection	Mounting Elevation (ft)	Orientation (Degrees)	Horizontal Length (ft)	Rise (in)
1	Cond BM	Center	Fixed	Left	Fixed	45.00	180.00	40.00	0.00
2	Equip BM	Center	Pinned	Left	Pinned	32.00	180.00	40.00	0.00
3	Equip BM	Center	Pinned	Left	Pinned	21.25	180.00	40.00	0.00

----- Multi Pole Arm Results -----

Arm Label	Arm Num	Arm Sec	Length (ft)	Tip Diam. (in)	Base Diam. (in)	Thick. (in)	Shaft Shape	Joint Type	Weight (lbs)	Controlling Load Case	Combined Stress (ksi)	Allowable Stress (ksi)	Safety Factor
Cond BM	1	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1TC1 NESC H	29.27	65.00	2.22
Equip BM	2	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1LC1 NESC H	10.03	65.00	6.48
Equip BM	3	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1LC1 NESC H	7.16	65.00	9.07

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** SUMMARY ***

----- Left DESIGN SUMMARY -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Section Characteristics	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
Weight (lbs)	6247	1109			

----- Left ANALYSIS SUMMARY -----

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Pole Top
Governing Load Case	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He
Height (ft)	0.00	0.00	48.00	65.00
Resultant Moment (in-kips)	14370	14370	600	2
Shear Force (lbs)	26771	26771	3121	2751
Axial Force (lbs)	27300	27300	2878	1212
Combined Stress (ksi)	34.81	34.81	4.67	0.56
Allowable Stress (ksi)	65.00	65.00	65.00	65.00
Allowable/Combined Stress	1.87	1.87	13.93	99.90
Total Deflection (in)	0.00	0.00	8.51	13.65

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** SUMMARY ***

----- Center DESIGN SUMMARY -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Section Characteristics	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
Weight (lbs)	6247	1109			

----- Center ANALYSIS SUMMARY -----

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Pole Top
Governing Load Case	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He
Height (ft)	0.00	0.00	48.00	65.00
Resultant Moment (in-kips)	14358	14358	600	2
Shear Force (lbs)	26670	26670	3121	2751
Axial Force (lbs)	31681	31681	2878	1212
Combined Stress (ksi)	34.84	34.84	4.67	0.56
Allowable Stress (ksi)	65.00	65.00	65.00	65.00
Allowable/Combined Stress	1.87	1.87	13.93	99.90
Total Deflection (in)	0.00	0.00	8.50	13.62

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

----- Pole Left SUMMARY OF SECTION DIMENSIONS AS DETAILED -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Flange Thickness (in)	1.500				
Weld Root Gap (in)	0.250				
Theoretical Design Section Dimension	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
As Detailed Section Characteristic	/First/	/Second/			
Base Diameter (in)	37.995	26.149			
Top Diameter (in)	26.221	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	47.833	16.854			

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

----- Pole Center SUMMARY OF SECTION DIMENSIONS AS DETAILED -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides

Connections Between Sections /First/

Height Above Ground (ft)	48.00
Type	Flange Joint
Flange Thickness (in)	1.500
Weld Root Gap (in)	0.250

Theoretical Design Section Dimension /First/ /Second/

Base Diameter (in)	38.000	26.185
Top Diameter (in)	26.185	22.000
Thickness (in)	0.37500	0.25000
Length (ft)	48.000	17.000

As Detailed Section Characteristic /First/ /Second/

Base Diameter (in)	37.995	26.149
Top Diameter (in)	26.221	22.000
Thickness (in)	0.37500	0.25000
Length (ft)	47.833	16.854

Note: Diameter are outside, measured across the flats

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Reaction Instance	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)
1TC1 NESC	Left	12954	-2691	13231	995	26780	6658	22984	23929
1TC1 NESC	Center	12986	-2647	13253	-1002	32251	6441	23016	23900
1LC1 NESC	Left	14229	-2005	14370	1071	27348	4398	26357	26722
1LC1 NESC	Center	14223	-1960	14358	-1083	31728	4202	26279	26613
1TC2 NESC	Left	7018	-2207	7357	480	17192	5516	12260	13444
1TC2 NESC	Center	7052	-2192	7385	-479	21738	5483	12339	13503
1LC2 NESC	Left	8286	-1523	8425	554	17748	3261	15635	15972
1LC2 NESC	Center	8284	-1507	8420	-559	21207	3239	15601	15934
2TC1 Extre	Left	7779	-4421	8947	617	15526	12729	13830	18796
2TC1 Extre	Center	7902	-4393	9041	-608	23507	12536	14169	18919
2LC1 Extre	Left	12820	-1746	12939	916	17707	3865	27271	27543
2LC1 Extre	Center	12817	-1717	12931	-924	21459	3735	27216	27471
2TC2 Extre	Left	3856	-3623	5291	291	9833	10905	6760	12830
2TC2 Extre	Center	3979	-3615	5376	-274	16191	10861	7139	12997
2LC2 Extre	Left	8881	-954	8932	586	11983	2053	20204	20308
2LC2 Extre	Center	8880	-944	8930	-589	14124	2047	20184	20288
3C1 Extrem	Left	11070	-1300	11146	848	24218	2881	19720	19929
3C1 Extrem	Center	11067	-1266	11140	-854	27017	2719	19680	19867
3C2 Extrem	Left	6364	-1131	6464	427	14052	2376	11160	11410
3C2 Extrem	Center	6363	-1126	6462	-429	16682	2424	11140	11400
4TC1 Ice a	Left	11418	-2149	11619	862	21373	5141	20193	20837
4TC1 Ice a	Center	11439	-2116	11633	-868	25892	4972	20207	20810
4LC1 Ice a	Left	12178	-1733	12301	907	21715	3779	22199	22519
4LC1 Ice a	Center	12174	-1700	12292	-916	25572	3621	22140	22434

Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Reaction Instance	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)
4TC2 Ice a Left		6633	-1732	6856	442	11369	4136	11526	12245
4TC2 Ice a Center		6655	-1729	6876	-442	15095	4178	11574	12305
4LC2 Ice a Left		7389	-1318	7505	486	11705	2776	13534	13815
4LC2 Ice a Center		7387	-1315	7503	-490	14772	2824	13506	13798
5TC1 Defle Left		3273	-1954	3812	282	15756	6084	5988	8536
5TC1 Defle Center		3344	-1930	3861	-271	19044	5900	6212	8567
5LC1 Defle Left		6205	-398	6217	455	17004	934	13812	13844
5LC1 Defle Center		6204	-373	6215	-456	17832	766	13807	13828
5TC2 Defle Left		1641	-1878	2494	143	11074	5873	3035	6611
5TC2 Defle Center		1712	-1869	2534	-132	14225	5811	3264	6665
5LC2 Defle Left		4566	-324	4577	315	12313	726	10861	10886
5LC2 Defle Center		4565	-314	4576	-316	13010	674	10858	10879
6 Construc Left		463	-1539	1607	37	21410	3415	951	3545
6 Construc Center		463	-1500	1569	-37	24878	3085	949	3228
6 Construc Left		2805	-577	2864	217	11561	1271	5102	5258
6 Construc Center		2805	-569	2862	-218	12826	1229	5098	5244

Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS LOCATIONS ***

Load Number	Mounted To	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Measured From	Description	Notes
1	Left	65.00	65.00	0.00	0.00	Left	Spike	
2	Center	65.00	65.00	0.00	0.00	Center	Spike	
3	Left	65.00	65.00	0.00	0.00	Left	OPGW	
4	Center	65.00	65.00	0.00	0.00	Center	OPGW	
5	Arm 1	45.00	45.00	7.00	180.00	Center	Conductor	
6	Arm 1	45.00	45.00	20.00	180.00	Center	Conductor	
7	Arm 1	45.00	45.00	33.00	180.00	Center	Conductor	
8	Arm 1	45.00	45.00	7.00	180.00	Center	Surge Arrester	
9	Arm 1	45.00	45.00	20.00	180.00	Center	Surge Arrester	
10	Arm 1	45.00	45.00	33.00	180.00	Center	Surge Arrester	
11	Left	30.00	30.00	1.50	90.00	Left	Flood Light	
12	Center	30.00	30.00	1.50	90.00	Center	Flood Light	
13	Left	30.00	30.00	1.50	270.00	Left	Flood Light	
14	Center	30.00	30.00	1.50	270.00	Center	Flood Light	
15	Arm 2	32.00	32.00	7.00	180.00	Center	Vee-Switch Back	
16	Arm 2	32.00	32.00	20.00	180.00	Center	Vee-Switch Back	
17	Arm 2	32.00	32.00	33.00	180.00	Center	Vee-Switch Back	
18	Arm 3	21.25	21.25	7.00	180.00	Center	Insulator Back	
19	Arm 3	21.25	21.25	20.00	180.00	Center	Insulator Back	
20	Arm 3	21.25	21.25	33.00	180.00	Center	Insulator Back	

Notes:

1. Load Eccentricity is defined as the distance along the member's axis.

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS LOCATIONS ***

Loading Case 1TC1 NESC Heavy - Continued

Load Number	Mounted To	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Measured From	Description	Orientation of System
								N
21	Arm 3	21.25	21.25	7.00	180.00	Center	Insulator Inv	
22	Arm 3	21.25	21.25	20.00	180.00	Center	Insulator Inv	
23	Arm 3	21.25	21.25	33.00	180.00	Center	Insulator Inv	

Notes:

1. Load Eccentricity is defined as the distance along the member's axis.

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35

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*** INPUT LOADS ***

Loading Case 1TC1 NESC Heavy

Basic Wind Pressure is 10.00 psf
 Wind Orientation is 0.0 Degrees Clockwise From +X Axis
 Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
 Structure Weight Overload Factor is 1.500
 Orientations are Measured Clockwise From +X Axis
 Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
 +***** +X-Axis
 * * (Transverse)
 * *
 * *
 * *
 (Longitudinal) * * (Vertical)
 +Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	28	0	81	0.00	-1.69	0.00	Spike
2	28	0	81	0.00	-1.69	0.00	Spike
3	700	2600	1200	0.00	0.00	0.00	OPGW
4	700	2600	1200	0.00	0.00	0.00	OPGW
5	2400	13600	5000	0.00	0.00	0.00	Conductor
6	2400	13600	5000	0.00	0.00	0.00	Conductor
7	2400	13600	5000	0.00	0.00	0.00	Conductor
8	26	0	176	0.00	-1.01	0.00	Surge Arrester
9	26	0	176	0.00	-1.01	0.00	Surge Arrester
10	26	0	176	0.00	-1.01	0.00	Surge Arrester
11	103	0	239	0.00	-1.55	0.00	Flood Light
12	103	0	239	0.00	-1.55	0.00	Flood Light
13	103	0	239	0.00	-1.55	0.00	Flood Light
14	103	0	239	0.00	-1.55	0.00	Flood Light
15	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
16	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
17	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
18	56	0	584	-18.11	0.00	1.74	Insulator Back
19	56	0	584	-18.11	0.00	1.74	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

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*** INPUT LOADS ***

Loading Case 1TC1 NESC Heavy - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	56	0	584	-18.11	0.00	1.74	Insulator Back
21	56	0	584	0.00	1.74	0.00	Insulator Inv
22	56	0	584	0.00	1.74	0.00	Insulator Inv
23	56	0	584	0.00	1.74	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 1LC1 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	28	81	1.69	0.00	0.00	Spike
2	0	28	81	1.69	0.00	0.00	Spike
3	700	2600	1200	0.00	0.00	0.00	OPGW
4	700	2600	1200	0.00	0.00	0.00	OPGW
5	2400	13600	5000	0.00	0.00	0.00	Conductor
6	2400	13600	5000	0.00	0.00	0.00	Conductor
7	2400	13600	5000	0.00	0.00	0.00	Conductor
8	0	26	176	1.01	0.00	0.00	Surge Arrester
9	0	26	176	1.01	0.00	0.00	Surge Arrester
10	0	26	176	1.01	0.00	0.00	Surge Arrester
11	0	103	239	1.55	0.00	0.00	Flood Light
12	0	103	239	1.55	0.00	0.00	Flood Light
13	0	103	239	1.55	0.00	0.00	Flood Light
14	0	103	239	1.55	0.00	0.00	Flood Light
15	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
16	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
17	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
18	0	0	584	-18.11	0.00	0.00	Insulator Back
19	0	0	584	-18.11	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

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*** INPUT LOADS ***

Loading Case 1LC1 NESC Heavy - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	584	-18.11	0.00	0.00	Insulator Back
21	0	56	584	-1.74	0.00	0.00	Insulator Inv
22	0	56	584	-1.74	0.00	0.00	Insulator Inv
23	0	56	584	-1.74	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 1TC2 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	28	0	81	0.00	-1.69	0.00	Spike
2	28	0	81	0.00	-1.69	0.00	Spike
3	700	2400	300	0.00	0.00	0.00	OPGW
4	700	2400	300	0.00	0.00	0.00	OPGW
5	1700	6600	-1100	0.00	0.00	0.00	Conductor
6	1700	6600	-1100	0.00	0.00	0.00	Conductor
7	1700	6600	-1100	0.00	0.00	0.00	Conductor
8	26	0	176	0.00	-1.01	0.00	Surge Arrester
9	26	0	176	0.00	-1.01	0.00	Surge Arrester
10	26	0	176	0.00	-1.01	0.00	Surge Arrester
11	103	0	239	0.00	-1.55	0.00	Flood Light
12	103	0	239	0.00	-1.55	0.00	Flood Light
13	103	0	239	0.00	-1.55	0.00	Flood Light
14	103	0	239	0.00	-1.55	0.00	Flood Light
15	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
16	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
17	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
18	56	0	584	-18.11	0.00	1.74	Insulator Back
19	56	0	584	-18.11	0.00	1.74	Insulator Back

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*** INPUT LOADS ***

Loading Case 1TC2 NESC Heavy - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	56	0	584	-18.11	0.00	1.74	Insulator Back
21	56	0	584	0.00	1.74	0.00	Insulator Inv
22	56	0	584	0.00	1.74	0.00	Insulator Inv
23	56	0	584	0.00	1.74	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 1LC2 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	28	81	1.69	0.00	0.00	Spike
2	0	28	81	1.69	0.00	0.00	Spike
3	700	2400	300	0.00	0.00	0.00	OPGW
4	700	2400	300	0.00	0.00	0.00	OPGW
5	1700	6600	-1100	0.00	0.00	0.00	Conductor
6	1700	6600	-1100	0.00	0.00	0.00	Conductor
7	1700	6600	-1100	0.00	0.00	0.00	Conductor
8	0	26	176	1.01	0.00	0.00	Surge Arrester
9	0	26	176	1.01	0.00	0.00	Surge Arrester
10	0	26	176	1.01	0.00	0.00	Surge Arrester
11	0	103	239	1.55	0.00	0.00	Flood Light
12	0	103	239	1.55	0.00	0.00	Flood Light
13	0	103	239	1.55	0.00	0.00	Flood Light
14	0	103	239	1.55	0.00	0.00	Flood Light
15	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
16	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
17	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
18	0	0	584	-18.11	0.00	0.00	Insulator Back
19	0	0	584	-18.11	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

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*** INPUT LOADS ***

Loading Case 1LC2 NESC Heavy - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	584	-18.11	0.00	0.00	Insulator Back
21	0	56	584	-1.74	0.00	0.00	Insulator Inv
22	0	56	584	-1.74	0.00	0.00	Insulator Inv
23	0	56	584	-1.74	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC1 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	80	0	40	0.00	-4.80	0.00	Spike
2	80	0	40	0.00	-4.80	0.00	Spike
3	500	1400	700	0.00	0.00	0.00	OPGW
4	500	1400	700	0.00	0.00	0.00	OPGW
5	2200	8400	3000	0.00	0.00	0.00	Conductor
6	2200	8400	3000	0.00	0.00	0.00	Conductor
7	2200	8400	3000	0.00	0.00	0.00	Conductor
8	86	0	110	0.00	-3.26	0.00	Surge Arrester
9	86	0	110	0.00	-3.26	0.00	Surge Arrester
10	86	0	110	0.00	-3.26	0.00	Surge Arrester
11	404	0	110	0.00	-6.06	0.00	Flood Light
12	404	0	110	0.00	-6.06	0.00	Flood Light
13	404	0	110	0.00	-6.06	0.00	Flood Light
14	404	0	110	0.00	-6.06	0.00	Flood Light
15	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
16	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
17	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
18	209	0	385	-11.94	0.00	6.47	Insulator Back
19	209	0	385	-11.94	0.00	6.47	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2TC1 Extreme Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	209	0	385	-11.94	0.00	6.47	Insulator Back
21	209	0	385	0.00	6.47	0.00	Insulator Inv
22	209	0	385	0.00	6.47	0.00	Insulator Inv
23	209	0	385	0.00	6.47	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2LC1 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	80	40	4.80	0.00	0.00	Spike
2	0	80	40	4.80	0.00	0.00	Spike
3	500	1400	700	0.00	0.00	0.00	OPGW
4	500	1400	700	0.00	0.00	0.00	OPGW
5	2200	8400	3000	0.00	0.00	0.00	Conductor
6	2200	8400	3000	0.00	0.00	0.00	Conductor
7	2200	8400	3000	0.00	0.00	0.00	Conductor
8	0	86	110	3.26	0.00	0.00	Surge Arrester
9	0	86	110	3.26	0.00	0.00	Surge Arrester
10	0	86	110	3.26	0.00	0.00	Surge Arrester
11	0	404	110	6.06	0.00	0.00	Flood Light
12	0	404	110	6.06	0.00	0.00	Flood Light
13	0	404	110	6.06	0.00	0.00	Flood Light
14	0	404	110	6.06	0.00	0.00	Flood Light
15	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
16	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
17	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
18	0	0	385	-11.94	0.00	0.00	Insulator Back
19	0	0	385	-11.94	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC1 Extreme Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	385	-11.94	0.00	0.00	Insulator Back
21	0	209	385	-6.47	0.00	0.00	Insulator Inv
22	0	209	385	-6.47	0.00	0.00	Insulator Inv
23	0	209	385	-6.47	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC2 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	80	0	40	0.00	-4.80	0.00	Spike
2	80	0	40	0.00	-4.80	0.00	Spike
3	400	1100	200	0.00	0.00	0.00	OPGW
4	400	1100	200	0.00	0.00	0.00	OPGW
5	1100	3900	-1000	0.00	0.00	0.00	Conductor
6	1100	3900	-1000	0.00	0.00	0.00	Conductor
7	1100	3900	-1000	0.00	0.00	0.00	Conductor
8	86	0	110	0.00	-3.26	0.00	Surge Arrester
9	86	0	110	0.00	-3.26	0.00	Surge Arrester
10	86	0	110	0.00	-3.26	0.00	Surge Arrester
11	404	0	110	0.00	-6.06	0.00	Flood Light
12	404	0	110	0.00	-6.06	0.00	Flood Light
13	404	0	110	0.00	-6.06	0.00	Flood Light
14	404	0	110	0.00	-6.06	0.00	Flood Light
15	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
16	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
17	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
18	209	0	385	-11.94	0.00	6.47	Insulator Back
19	209	0	385	-11.94	0.00	6.47	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC2 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	209	0	385	-11.94	0.00	6.47	Insulator Back
21	209	0	385	0.00	6.47	0.00	Insulator Inv
22	209	0	385	0.00	6.47	0.00	Insulator Inv
23	209	0	385	0.00	6.47	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC2 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	80	40	4.80	0.00	0.00	Spike
2	0	80	40	4.80	0.00	0.00	Spike
3	400	1100	200	0.00	0.00	0.00	OPGW
4	400	1100	200	0.00	0.00	0.00	OPGW
5	1100	3900	-1000	0.00	0.00	0.00	Conductor
6	1100	3900	-1000	0.00	0.00	0.00	Conductor
7	1100	3900	-1000	0.00	0.00	0.00	Conductor
8	0	86	110	3.26	0.00	0.00	Surge Arrester
9	0	86	110	3.26	0.00	0.00	Surge Arrester
10	0	86	110	3.26	0.00	0.00	Surge Arrester
11	0	404	110	6.06	0.00	0.00	Flood Light
12	0	404	110	6.06	0.00	0.00	Flood Light
13	0	404	110	6.06	0.00	0.00	Flood Light
14	0	404	110	6.06	0.00	0.00	Flood Light
15	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
16	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
17	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
18	0	0	385	-11.94	0.00	0.00	Insulator Back
19	0	0	385	-11.94	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC2 Extreme Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	385	-11.94	0.00	0.00	Insulator Back
21	0	209	385	-6.47	0.00	0.00	Insulator Inv
22	0	209	385	-6.47	0.00	0.00	Insulator Inv
23	0	209	385	-6.47	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C1 Extreme Ice

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.100

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	101	0.00	0.00	0.00	Spike
2	0	0	101	0.00	0.00	0.00	Spike
3	400	2300	1500	0.00	0.00	0.00	OPGW
4	400	2300	1500	0.00	0.00	0.00	OPGW
5	1600	11600	4900	0.00	0.00	0.00	Conductor
6	1600	11600	4900	0.00	0.00	0.00	Conductor
7	1600	11600	4900	0.00	0.00	0.00	Conductor
8	0	0	166	0.00	0.00	0.00	Surge Arrester
9	0	0	166	0.00	0.00	0.00	Surge Arrester
10	0	0	166	0.00	0.00	0.00	Surge Arrester
11	0	0	277	0.00	0.00	0.00	Flood Light
12	0	0	277	0.00	0.00	0.00	Flood Light
13	0	0	277	0.00	0.00	0.00	Flood Light
14	0	0	277	0.00	0.00	0.00	Flood Light
15	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
16	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
17	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
18	0	0	500	-15.50	0.00	0.00	Insulator Back
19	0	0	500	-15.50	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C1 Extreme Ice - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	500	-15.50	0.00	0.00	Insulator Back
21	0	0	500	0.00	0.00	0.00	Insulator Inv
22	0	0	500	0.00	0.00	0.00	Insulator Inv
23	0	0	500	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C2 Extreme Ice

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.100

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	101	0.00	0.00	0.00	Spike
2	0	0	101	0.00	0.00	0.00	Spike
3	600	2300	400	0.00	0.00	0.00	OPGW
4	600	2300	400	0.00	0.00	0.00	OPGW
5	1200	5900	-1200	0.00	0.00	0.00	Conductor
6	1200	5900	-1200	0.00	0.00	0.00	Conductor
7	1200	5900	-1200	0.00	0.00	0.00	Conductor
8	0	0	166	0.00	0.00	0.00	Surge Arrester
9	0	0	166	0.00	0.00	0.00	Surge Arrester
10	0	0	166	0.00	0.00	0.00	Surge Arrester
11	0	0	277	0.00	0.00	0.00	Flood Light
12	0	0	277	0.00	0.00	0.00	Flood Light
13	0	0	277	0.00	0.00	0.00	Flood Light
14	0	0	277	0.00	0.00	0.00	Flood Light
15	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
16	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
17	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
18	0	0	500	-15.50	0.00	0.00	Insulator Back
19	0	0	500	-15.50	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C2 Extreme Ice - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	500	-15.50	0.00	0.00	Insulator Back
21	0	0	500	0.00	0.00	0.00	Insulator Inv
22	0	0	500	0.00	0.00	0.00	Insulator Inv
23	0	0	500	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC1 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	21	0	78	0.00	-1.29	0.00	Spike
2	21	0	78	0.00	-1.29	0.00	Spike
3	700	2500	1500	0.00	0.00	0.00	OPGW
4	700	2500	1500	0.00	0.00	0.00	OPGW
5	2000	11800	4900	0.00	0.00	0.00	Conductor
6	2000	11800	4900	0.00	0.00	0.00	Conductor
7	2000	11800	4900	0.00	0.00	0.00	Conductor
8	19	0	139	0.00	-0.71	0.00	Surge Arrester
9	19	0	139	0.00	-0.71	0.00	Surge Arrester
10	19	0	139	0.00	-0.71	0.00	Surge Arrester
11	63	0	221	0.00	-0.94	0.00	Flood Light
12	63	0	221	0.00	-0.94	0.00	Flood Light
13	63	0	221	0.00	-0.94	0.00	Flood Light
14	63	0	221	0.00	-0.94	0.00	Flood Light
15	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
16	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
17	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
18	35	0	432	-13.39	0.00	1.10	Insulator Back
19	35	0	432	-13.39	0.00	1.10	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC1 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	35	0	432	-13.39	0.00	1.10	Insulator Back
21	35	0	432	0.00	1.10	0.00	Insulator Inv
22	35	0	432	0.00	1.10	0.00	Insulator Inv
23	35	0	432	0.00	1.10	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4LC1 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	21	78	1.29	0.00	0.00	Spike
2	0	21	78	1.29	0.00	0.00	Spike
3	700	2500	1500	0.00	0.00	0.00	OPGW
4	700	2500	1500	0.00	0.00	0.00	OPGW
5	2000	11800	4900	0.00	0.00	0.00	Conductor
6	2000	11800	4900	0.00	0.00	0.00	Conductor
7	2000	11800	4900	0.00	0.00	0.00	Conductor
8	0	19	139	0.71	0.00	0.00	Surge Arrester
9	0	19	139	0.71	0.00	0.00	Surge Arrester
10	0	19	139	0.71	0.00	0.00	Surge Arrester
11	0	63	221	0.94	0.00	0.00	Flood Light
12	0	63	221	0.94	0.00	0.00	Flood Light
13	0	63	221	0.94	0.00	0.00	Flood Light
14	0	63	221	0.94	0.00	0.00	Flood Light
15	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
16	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
17	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
18	0	0	432	-13.39	0.00	0.00	Insulator Back
19	0	0	432	-13.39	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4LC1 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	432	-13.39	0.00	0.00	Insulator Back
21	0	35	432	-1.10	0.00	0.00	Insulator Inv
22	0	35	432	-1.10	0.00	0.00	Insulator Inv
23	0	35	432	-1.10	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC2 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	21	0	78	0.00	-1.29	0.00	Spike
2	21	0	78	0.00	-1.29	0.00	Spike
3	700	2400	400	0.00	0.00	0.00	OPGW
4	700	2400	400	0.00	0.00	0.00	OPGW
5	1400	6100	-1300	0.00	0.00	0.00	Conductor
6	1400	6100	-1300	0.00	0.00	0.00	Conductor
7	1400	6100	-1300	0.00	0.00	0.00	Conductor
8	19	0	139	0.00	-0.71	0.00	Surge Arrester
9	19	0	139	0.00	-0.71	0.00	Surge Arrester
10	19	0	139	0.00	-0.71	0.00	Surge Arrester
11	63	0	221	0.00	-0.94	0.00	Flood Light
12	63	0	221	0.00	-0.94	0.00	Flood Light
13	63	0	221	0.00	-0.94	0.00	Flood Light
14	63	0	221	0.00	-0.94	0.00	Flood Light
15	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
16	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
17	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
18	35	0	432	-13.39	0.00	1.10	Insulator Back
19	35	0	432	-13.39	0.00	1.10	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC2 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	35	0	432	-13.39	0.00	1.10	Insulator Back
21	35	0	432	0.00	1.10	0.00	Insulator Inv
22	35	0	432	0.00	1.10	0.00	Insulator Inv
23	35	0	432	0.00	1.10	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4LC2 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	21	78	1.29	0.00	0.00	Spike
2	0	21	78	1.29	0.00	0.00	Spike
3	700	2400	400	0.00	0.00	0.00	OPGW
4	700	2400	400	0.00	0.00	0.00	OPGW
5	1400	6100	-1300	0.00	0.00	0.00	Conductor
6	1400	6100	-1300	0.00	0.00	0.00	Conductor
7	1400	6100	-1300	0.00	0.00	0.00	Conductor
8	0	19	139	0.71	0.00	0.00	Surge Arrester
9	0	19	139	0.71	0.00	0.00	Surge Arrester
10	0	19	139	0.71	0.00	0.00	Surge Arrester
11	0	63	221	0.94	0.00	0.00	Flood Light
12	0	63	221	0.94	0.00	0.00	Flood Light
13	0	63	221	0.94	0.00	0.00	Flood Light
14	0	63	221	0.94	0.00	0.00	Flood Light
15	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
16	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
17	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
18	0	0	432	-13.39	0.00	0.00	Insulator Back
19	0	0	432	-13.39	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 4LC2 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	432	-13.39	0.00	0.00	Insulator Back
21	0	35	432	-1.10	0.00	0.00	Insulator Inv
22	0	35	432	-1.10	0.00	0.00	Insulator Inv
23	0	35	432	-1.10	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5TC1 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	47	0	37	0.00	-2.80	0.00	Spike
2	47	0	37	0.00	-2.80	0.00	Spike
3	100	400	500	0.00	0.00	0.00	OPGW
4	100	400	500	0.00	0.00	0.00	OPGW
5	500	3800	2600	0.00	0.00	0.00	Conductor
6	500	3800	2600	0.00	0.00	0.00	Conductor
7	500	3800	2600	0.00	0.00	0.00	Conductor
8	50	0	100	0.00	-1.90	0.00	Surge Arrester
9	50	0	100	0.00	-1.90	0.00	Surge Arrester
10	50	0	100	0.00	-1.90	0.00	Surge Arrester
11	235	0	100	0.00	-3.53	0.00	Flood Light
12	235	0	100	0.00	-3.53	0.00	Flood Light
13	235	0	100	0.00	-3.53	0.00	Flood Light
14	235	0	100	0.00	-3.53	0.00	Flood Light
15	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
16	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
17	245	0	800	-57.60	0.00	18.90	Vee-Switch Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5TC1 Deflection - Continued

Load Number							Orientation of System
	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	121	0	350	-10.85	0.00	3.76	Insulator Back
19	121	0	350	-10.85	0.00	3.76	Insulator Back
20	121	0	350	-10.85	0.00	3.76	Insulator Back
21	121	0	350	0.00	3.76	0.00	Insulator Inv
22	121	0	350	0.00	3.76	0.00	Insulator Inv
23	121	0	350	0.00	3.76	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5LC1 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	47	37	2.80	0.00	0.00	Spike
2	0	47	37	2.80	0.00	0.00	Spike
3	100	400	500	0.00	0.00	0.00	OPGW
4	100	400	500	0.00	0.00	0.00	OPGW
5	500	3800	2600	0.00	0.00	0.00	Conductor
6	500	3800	2600	0.00	0.00	0.00	Conductor
7	500	3800	2600	0.00	0.00	0.00	Conductor
8	0	50	100	1.90	0.00	0.00	Surge Arrester
9	0	50	100	1.90	0.00	0.00	Surge Arrester
10	0	50	100	1.90	0.00	0.00	Surge Arrester
11	0	235	100	3.53	0.00	0.00	Flood Light
12	0	235	100	3.53	0.00	0.00	Flood Light
13	0	235	100	3.53	0.00	0.00	Flood Light
14	0	235	100	3.53	0.00	0.00	Flood Light
15	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
16	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
17	0	104	800	-57.60	0.00	0.00	Vee-Switch Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5LC1 Deflection - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
18	0	0	350	-10.85	0.00	0.00	Insulator Back
19	0	0	350	-10.85	0.00	0.00	Insulator Back
20	0	0	350	-10.85	0.00	0.00	Insulator Back
21	0	121	350	-3.76	0.00	0.00	Insulator Inv
22	0	121	350	-3.76	0.00	0.00	Insulator Inv
23	0	121	350	-3.76	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5TC2 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	47	0	37	0.00	-2.80	0.00	Spike
2	47	0	37	0.00	-2.80	0.00	Spike
3	100	300	100	0.00	0.00	0.00	OPGW
4	100	300	100	0.00	0.00	0.00	OPGW
5	400	1900	-300	0.00	0.00	0.00	Conductor
6	400	1900	-300	0.00	0.00	0.00	Conductor
7	400	1900	-300	0.00	0.00	0.00	Conductor
8	50	0	100	0.00	-1.90	0.00	Surge Arrester
9	50	0	100	0.00	-1.90	0.00	Surge Arrester
10	50	0	100	0.00	-1.90	0.00	Surge Arrester
11	235	0	100	0.00	-3.53	0.00	Flood Light
12	235	0	100	0.00	-3.53	0.00	Flood Light
13	235	0	100	0.00	-3.53	0.00	Flood Light
14	235	0	100	0.00	-3.53	0.00	Flood Light
15	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
16	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
17	245	0	800	-57.60	0.00	18.90	Vee-Switch Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 5TC2 Deflection - Continued

Load Number							Orientation of System
	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	121	0	350	-10.85	0.00	3.76	Insulator Back
19	121	0	350	-10.85	0.00	3.76	Insulator Back
20	121	0	350	-10.85	0.00	3.76	Insulator Back
21	121	0	350	0.00	3.76	0.00	Insulator Inv
22	121	0	350	0.00	3.76	0.00	Insulator Inv
23	121	0	350	0.00	3.76	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5LC2 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	47	37	2.80	0.00	0.00	Spike
2	0	47	37	2.80	0.00	0.00	Spike
3	100	300	100	0.00	0.00	0.00	OPGW
4	100	300	100	0.00	0.00	0.00	OPGW
5	400	1900	-300	0.00	0.00	0.00	Conductor
6	400	1900	-300	0.00	0.00	0.00	Conductor
7	400	1900	-300	0.00	0.00	0.00	Conductor
8	0	50	100	1.90	0.00	0.00	Surge Arrester
9	0	50	100	1.90	0.00	0.00	Surge Arrester
10	0	50	100	1.90	0.00	0.00	Surge Arrester
11	0	235	100	3.53	0.00	0.00	Flood Light
12	0	235	100	3.53	0.00	0.00	Flood Light
13	0	235	100	3.53	0.00	0.00	Flood Light
14	0	235	100	3.53	0.00	0.00	Flood Light
15	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
16	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
17	0	104	800	-57.60	0.00	0.00	Vee-Switch Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 5LC2 Deflection - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
18	0	0	350	-10.85	0.00	0.00	Insulator Back
19	0	0	350	-10.85	0.00	0.00	Insulator Back
20	0	0	350	-10.85	0.00	0.00	Insulator Back
21	0	121	350	-3.76	0.00	0.00	Insulator Inv
22	0	121	350	-3.76	0.00	0.00	Insulator Inv
23	0	121	350	-3.76	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.000

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	37	0.00	0.00	0.00	Spike
2	0	0	37	0.00	0.00	0.00	Spike
3	700	200	1600	0.00	0.00	0.00	OPGW
4	700	200	1600	0.00	0.00	0.00	OPGW
5	1700	500	5700	0.00	0.00	0.00	Conductor
6	1700	500	5700	0.00	0.00	0.00	Conductor
7	1700	500	5700	0.00	0.00	0.00	Conductor
8	0	0	100	0.00	0.00	0.00	Surge Arrester
9	0	0	100	0.00	0.00	0.00	Surge Arrester
10	0	0	100	0.00	0.00	0.00	Surge Arrester
11	0	0	100	0.00	0.00	0.00	Flood Light
12	0	0	100	0.00	0.00	0.00	Flood Light
13	0	0	100	0.00	0.00	0.00	Flood Light
14	0	0	100	0.00	0.00	0.00	Flood Light
15	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
16	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
17	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
18	0	0	350	-10.85	0.00	0.00	Insulator Back
19	0	0	350	-10.85	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	350	-10.85	0.00	0.00	Insulator Back
21	0	0	350	0.00	0.00	0.00	Insulator Inv
22	0	0	350	0.00	0.00	0.00	Insulator Inv
23	0	0	350	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.000

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	37	0.00	0.00	0.00	Spike
2	0	0	37	0.00	0.00	0.00	Spike
3	200	600	100	0.00	0.00	0.00	OPGW
4	200	600	100	0.00	0.00	0.00	OPGW
5	700	3000	-600	0.00	0.00	0.00	Conductor
6	700	3000	-600	0.00	0.00	0.00	Conductor
7	700	3000	-600	0.00	0.00	0.00	Conductor
8	0	0	100	0.00	0.00	0.00	Surge Arrester
9	0	0	100	0.00	0.00	0.00	Surge Arrester
10	0	0	100	0.00	0.00	0.00	Surge Arrester
11	0	0	100	0.00	0.00	0.00	Flood Light
12	0	0	100	0.00	0.00	0.00	Flood Light
13	0	0	100	0.00	0.00	0.00	Flood Light
14	0	0	100	0.00	0.00	0.00	Flood Light
15	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
16	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
17	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
18	0	0	350	-10.85	0.00	0.00	Insulator Back
19	0	0	350	-10.85	0.00	0.00	Insulator Back

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
20	0	0	350	-10.85	0.00	0.00	Insulator Back
21	0	0	350	0.00	0.00	0.00	Insulator Inv
22	0	0	350	0.00	0.00	0.00	Insulator Inv
23	0	0	350	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** Left Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 2	65.00	22.000	0.2500	88.00	20.90	1059	17.48
	60.00	23.231	0.2500	92.92	22.22	1249	18.47
	55.00	24.462	0.2500	97.85	23.54	1460	19.46
	50.00	25.692	0.2500	102.77	24.86	1694	20.45
	48.00	26.185	0.2500	104.74	25.39	1795	20.85
Top of Sect 1	48.00	26.185	0.3750	69.83	16.03	2654	31.12
Start of Sect 1	45.00	26.923	0.3750	71.80	16.56	2888	32.01
	40.00	28.154	0.3750	75.08	17.44	3308	33.50
	35.00	29.385	0.3750	78.36	18.32	3768	34.98
	32.00	30.123	0.3750	80.33	18.84	4063	35.87
	30.00	30.616	0.3750	81.64	19.20	4268	36.46
	25.00	31.846	0.3750	84.92	20.08	4811	37.95
	21.25	32.769	0.3750	87.38	20.74	5247	39.06
	20.00	33.077	0.3750	88.21	20.96	5397	39.43
	15.00	34.308	0.3750	91.49	21.83	6030	40.92
	10.00	35.539	0.3750	94.77	22.71	6710	42.40
	5.00	36.769	0.3750	98.05	23.59	7440	43.88
Base of Sect 1	0.00	38.000	0.3750	101.33	24.47	8220	45.37

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
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*** Center Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 2	65.00	22.000	0.2500	88.00	20.90	1059	17.48
	60.00	23.231	0.2500	92.92	22.22	1249	18.47
	55.00	24.462	0.2500	97.85	23.54	1460	19.46
	50.00	25.692	0.2500	102.77	24.86	1694	20.45
	48.00	26.185	0.2500	104.74	25.39	1795	20.85
Top of Sect 1	48.00	26.185	0.3750	69.83	16.03	2654	31.12
End of Sect 1	45.00	26.923	0.3750	71.80	16.56	2888	32.01
	40.00	28.154	0.3750	75.08	17.44	3308	33.50
	35.00	29.385	0.3750	78.36	18.32	3768	34.98
	32.00	30.123	0.3750	80.33	18.84	4063	35.87
	30.00	30.616	0.3750	81.64	19.20	4268	36.46
	25.00	31.846	0.3750	84.92	20.08	4811	37.95
	21.25	32.769	0.3750	87.38	20.74	5247	39.06
	20.00	33.077	0.3750	88.21	20.96	5397	39.43
	15.00	34.308	0.3750	91.49	21.83	6030	40.92
	10.00	35.539	0.3750	94.77	22.71	6710	42.40
	5.00	36.769	0.3750	98.05	23.59	7440	43.88
Base of Sect 1	0.00	38.000	0.3750	101.33	24.47	8220	45.37

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** Arm 1 (Cond BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** Arm 2 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** Arm 3 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	748	2625	2730	1216
60.00	158	-49	165	0	844	2635	2767	1676
55.00	316	-103	333	0	945	2645	2809	2161
50.00	475	-163	502	0	1051	2655	2855	2671
48.00	539	-189	571	0	1095	2659	2876	2882
48.00	539	-189	571	0	1095	2659	2875	2883
45.00	635	-229	675	0	1163	2669	2911	3366
45.00	638	-290	700	1345	-458	23279	23284	9447
40.00	2035	-265	2052	1345	-367	23284	23286	10312
35.00	3433	-246	3441	1345	-264	23285	23286	11218
32.00	4271	-238	4278	1345	-188	23295	23296	11761
32.00	4079	-237	4085	1119	6123	23272	24063	15967
30.00	4637	-385	4653	1119	6174	23278	24083	16336
30.00	4637	-388	4653	1119	6369	23261	24117	16853
25.00	6033	-773	6083	1119	6484	23240	24128	17856
21.25	7079	-1067	7159	1119	6587	23251	24166	18593
21.25	7054	-1066	7134	995	6122	23256	24048	21891
20.00	7402	-1158	7492	995	6144	23221	24020	22185
15.00	8796	-1530	8928	995	6264	23164	23996	23283
10.00	10186	-1910	10364	995	6388	23099	23966	24423
5.00	11573	-2296	11798	995	6515	23024	23928	25602
0.00	12954	-2692	13231	995	6671	23026	23973	26741

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	717	2634	2730	1217
60.00	158	-48	165	0	812	2645	2767	1676
55.00	317	-99	333	0	912	2656	2808	2162
50.00	477	-157	502	0	1018	2667	2855	2672
48.00	541	-182	571	0	1062	2672	2875	2883
48.00	541	-182	571	0	1061	2671	2874	2884
45.00	638	-222	675	0	1129	2683	2910	3367
45.00	635	1155	1318	-1348	10084	23318	25405	14908
40.00	2035	546	2107	-1348	10232	23306	25453	15769
35.00	3434	-73	3434	-1348	10373	23293	25498	16675
32.00	4272	-447	4296	-1348	10449	23303	25539	17218
32.00	4078	-448	4103	-1125	4526	23407	23841	21461
30.00	4640	-557	4673	-1125	4577	23414	23857	21830
30.00	4640	-561	4674	-1125	4792	23384	23870	22347
25.00	6044	-853	6103	-1125	4930	23345	23860	23350
21.25	7094	-1077	7176	-1125	5033	23356	23892	24087
21.25	7067	-1078	7148	-1002	5840	23378	24097	27361
20.00	7417	-1166	7508	-1002	5874	23329	24058	27655
15.00	8817	-1523	8948	-1002	6012	23252	24016	28754
10.00	10213	-1889	10386	-1002	6151	23164	23967	29893
5.00	11602	-2264	11821	-1002	6291	23067	23910	31073
0.00	12986	-2646	13253	-1002	6448	23069	23953	32212

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1345	-60	1347	-3	-6070	20617	21492	1589
37.50	-727	119	737	-3	-5883	20613	21436	1589
35.00	-108	293	313	-3	-5694	20612	21384	1563
33.00	386	428	576	-3	-5544	20609	21341	1563
33.00	386	429	577	-3	-675	6915	6948	4121
30.00	635	449	778	-3	-446	6906	6920	4130
27.50	842	460	960	-3	-256	6896	6901	4140
25.00	1049	465	1147	-3	-65	6885	6885	4152
22.50	1256	464	1338	-3	126	6872	6873	4167
20.00	1462	457	1531	-3	314	6868	6875	4167
20.00	1462	458	1532	-3	5194	-6856	8601	6585
17.50	1256	300	1291	-3	5382	-6860	8719	6584
15.00	1050	135	1058	-3	5573	-6878	8853	6566
12.50	843	-35	844	-3	5762	-6894	8985	6552
10.00	636	-211	670	-3	5949	-6908	9117	6543
7.00	387	-429	577	-3	6172	-6921	9273	6537
7.00	387	-428	576	-3	11043	-20656	23423	8844
5.00	-109	-694	703	-3	11183	-20658	23491	8862
2.50	-729	-1033	1264	-3	11355	-20652	23567	8907
0.00	-1349	-1376	1927	-3	11543	-20656	23662	8907

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	226	0	226	193	-4172	-10	4172	-6328
37.50	226	122	257	193	-3985	-12	3985	-6327
35.00	225	239	329	193	-3800	-15	3800	-6324
33.00	225	329	398	193	-3650	-17	3650	-6324
33.00	235	328	403	63	-1855	-47	1855	-6194
30.00	233	391	455	63	-1630	-50	1630	-6193
27.50	232	437	495	63	-1447	-51	1448	-6191
25.00	230	478	530	63	-1264	-52	1265	-6190
22.50	228	513	562	63	-1081	-53	1082	-6189
20.00	227	543	588	63	-899	-54	901	-6188
20.00	236	543	592	-66	895	-81	899	-6066
17.50	234	513	564	-66	1078	-82	1081	-6067
15.00	231	478	531	-66	1261	-83	1263	-6069
12.50	229	437	493	-66	1444	-84	1446	-6070
10.00	226	391	452	-66	1627	-85	1629	-6072
7.00	223	328	397	-66	1853	-89	1855	-6073
7.00	232	329	402	-196	3649	-119	3651	-5960
5.00	229	239	331	-196	3800	-121	3802	-5960
2.50	226	122	257	-196	3985	-124	3987	-5963
0.00	222	0	222	-196	4172	-127	4174	-5964

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	124	0	124	26	-3266	30	3266	450
37.50	125	95	157	26	-3078	27	3078	451
35.00	126	185	223	26	-2891	25	2891	453
33.00	126	252	282	26	-2741	23	2741	453
33.00	128	250	281	8	-1572	7	1572	569
30.00	128	303	329	8	-1347	4	1347	571
27.50	128	341	364	8	-1159	2	1159	572
25.00	128	373	394	8	-971	-1	971	573
22.50	128	399	419	8	-784	-3	784	574
20.00	128	420	439	8	-596	-6	596	574
20.00	130	418	438	-10	573	-21	573	686
17.50	129	398	418	-10	760	-23	761	685
15.00	128	372	394	-10	949	-26	949	685
12.50	128	341	364	-10	1137	-28	1137	684
10.00	127	304	329	-10	1325	-31	1325	683
7.00	125	252	282	-10	1550	-34	1551	681
7.00	127	251	281	-28	2719	-50	2720	789
5.00	126	183	223	-28	2870	-52	2870	788
2.50	124	95	156	-28	3058	-55	3058	787
0.00	123	0	123	-28	3246	-58	3246	786

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.1	12.6	12.7	0.1	0.02	0.07	0.00	0.32	0.55	65.00	99.90
60.00	1.8	11.1	11.3	0.1	1.59	0.09	0.00	0.30	1.68	65.00	38.64
55.00	1.6	9.7	9.9	0.1	2.88	0.11	0.00	0.29	2.99	65.00	21.73
50.00	1.4	8.4	8.5	0.1	3.93	0.13	0.00	0.28	4.07	65.00	15.99
48.00	1.3	7.8	7.9	0.1	4.30	0.14	0.00	0.28	4.44	65.00	14.64
48.00	1.3	7.8	7.9	0.1	2.91	0.09	0.00	0.19	3.00	65.00	21.65
45.00	1.2	7.0	7.1	0.1	3.25	0.11	0.00	0.18	3.35	65.00	19.39
45.00	1.2	7.0	7.1	0.1	3.33	0.30	3.17	4.64	8.32	65.00	7.81
40.00	1.0	5.7	5.8	0.1	8.96	0.31	2.89	4.30	10.87	65.00	5.98
35.00	0.8	4.5	4.5	0.0	13.64	0.32	2.65	4.00	14.91	65.00	4.36
32.00	0.7	3.8	3.8	0.0	16.07	0.33	2.52	3.84	17.13	65.00	3.79
32.00	0.7	3.8	3.8	0.0	15.35	0.45	2.10	3.45	16.21	65.00	4.01
30.00	0.6	3.3	3.4	0.0	17.00	0.45	2.03	3.37	17.80	65.00	3.65
30.00	0.6	3.3	3.4	0.0	17.00	0.46	2.03	3.37	17.81	65.00	3.65
25.00	0.4	2.4	2.4	0.0	20.66	0.47	1.87	3.16	21.37	65.00	3.04
21.25	0.3	1.7	1.8	0.0	23.00	0.48	1.77	3.02	23.67	65.00	2.75
21.25	0.3	1.7	1.8	0.0	22.92	0.56	1.57	2.82	23.64	65.00	2.75
20.00	0.3	1.5	1.6	0.0	23.63	0.56	1.54	2.78	24.34	65.00	2.67
15.00	0.2	0.9	0.9	0.0	26.19	0.57	1.43	2.62	26.87	65.00	2.42
10.00	0.1	0.4	0.4	0.0	28.33	0.58	1.33	2.48	29.00	65.00	2.24
5.00	0.0	0.1	0.1	0.0	30.12	0.58	1.25	2.35	30.78	65.00	2.11
0.00	0.0	0.0	0.0	0.0	31.61	0.59	1.17	2.23	32.26	65.00	2.01

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.9	12.6	12.7	0.1	0.02	0.07	0.00	0.32	0.55	65.00	99.90
60.00	1.7	11.2	11.3	0.1	1.59	0.09	0.00	0.30	1.68	65.00	38.63
55.00	1.5	9.7	9.9	0.1	2.88	0.11	0.00	0.29	2.99	65.00	21.72
50.00	1.3	8.4	8.5	0.1	3.94	0.13	0.00	0.28	4.07	65.00	15.98
48.00	1.3	7.8	7.9	0.1	4.30	0.14	0.00	0.28	4.44	65.00	14.63
48.00	1.3	7.8	7.9	0.1	2.91	0.09	0.00	0.19	3.00	65.00	21.64
45.00	1.2	7.0	7.1	0.1	3.25	0.11	0.00	0.18	3.35	65.00	19.38
45.00	1.2	7.0	7.1	0.1	6.18	0.47	3.17	4.77	10.59	65.00	6.14
40.00	1.0	5.7	5.8	0.1	9.28	0.47	2.90	4.43	11.82	65.00	5.50
35.00	0.8	4.5	4.5	0.0	13.47	0.48	2.66	4.12	15.12	65.00	4.30
32.00	0.7	3.8	3.9	0.0	16.28	0.48	2.53	3.96	17.43	65.00	3.73
32.00	0.7	3.8	3.9	0.0	15.56	0.60	2.11	3.45	16.53	65.00	3.93
30.00	0.6	3.4	3.4	0.0	17.18	0.60	2.04	3.36	18.09	65.00	3.59
30.00	0.6	3.4	3.4	0.0	17.18	0.61	2.04	3.36	18.11	65.00	3.59
25.00	0.4	2.4	2.4	0.0	20.76	0.62	1.88	3.15	21.61	65.00	3.01
21.25	0.3	1.7	1.8	0.0	23.06	0.62	1.78	3.01	23.86	65.00	2.72
21.25	0.3	1.7	1.8	0.0	22.97	0.70	1.58	2.83	23.83	65.00	2.73
20.00	0.3	1.5	1.6	0.0	23.69	0.70	1.55	2.79	24.53	65.00	2.65
15.00	0.2	0.9	0.9	0.0	26.24	0.70	1.44	2.63	27.06	65.00	2.40
10.00	0.1	0.4	0.4	0.0	28.38	0.71	1.34	2.49	29.18	65.00	2.23
5.00	0.0	0.1	0.1	0.0	30.17	0.71	1.26	2.36	30.96	65.00	2.10
0.00	0.0	0.0	0.0	0.0	31.65	0.71	1.17	2.24	32.43	65.00	2.00

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.2	7.0	7.1	0.1	20.14	0.11	0.02	3.01	20.25	65.00	3.21
37.50	1.2	7.2	7.3	0.2	11.41	0.11	0.02	3.00	11.97	65.00	5.43
35.00	1.2	7.5	7.5	0.3	4.97	0.11	0.02	2.99	7.23	65.00	8.99
33.00	1.2	7.7	7.7	0.3	8.64	0.11	0.02	2.99	9.67	65.00	6.72
33.00	1.2	7.7	7.7	0.3	8.66	0.28	0.02	0.99	9.06	65.00	7.17
30.00	1.2	7.9	8.0	0.4	12.07	0.28	0.02	0.99	12.36	65.00	5.26
27.50	1.2	8.1	8.2	0.5	15.18	0.28	0.02	0.98	15.47	65.00	4.20
25.00	1.2	8.3	8.4	0.5	18.25	0.28	0.02	0.98	18.54	65.00	3.51
22.50	1.2	8.4	8.5	0.5	21.28	0.28	0.02	0.98	21.57	65.00	3.01
20.00	1.2	8.4	8.5	0.4	24.27	0.28	0.02	0.98	24.56	65.00	2.65
20.00	1.2	8.4	8.5	0.4	24.28	0.45	0.02	1.22	24.73	65.00	2.63
17.50	1.2	8.4	8.5	0.4	20.28	0.45	0.02	1.23	20.74	65.00	3.13
15.00	1.2	8.3	8.4	0.3	16.25	0.45	0.02	1.25	16.71	65.00	3.89
12.50	1.2	8.1	8.2	0.2	12.60	0.45	0.02	1.27	13.19	65.00	4.93
10.00	1.2	7.9	8.0	0.2	10.63	0.44	0.02	1.29	11.25	65.00	5.78
7.00	1.2	7.7	7.8	0.1	8.65	0.44	0.02	1.31	9.35	65.00	6.95
7.00	1.2	7.7	7.8	0.1	8.64	0.60	0.02	3.27	10.84	65.00	6.00
5.00	1.2	7.5	7.6	0.0	10.87	0.60	0.02	3.28	12.03	65.00	5.40
2.50	1.2	7.2	7.3	0.0	19.62	0.61	0.02	3.29	20.54	65.00	3.16
0.00	1.2	7.0	7.1	0.1	28.44	0.61	0.02	3.31	29.27	65.00	2.22

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	3.8	3.8	0.0	3.32	0.43	1.48	2.06	4.59	65.00	14.15
37.50	0.7	3.9	3.9	0.2	4.06	0.43	1.48	2.04	5.01	65.00	12.97
35.00	0.7	3.9	4.0	0.3	4.89	0.43	1.48	2.01	5.76	65.00	11.29
33.00	0.7	4.0	4.1	0.4	6.20	0.43	1.48	1.99	6.99	65.00	9.30
33.00	0.7	4.0	4.1	0.4	6.25	0.42	0.49	0.74	6.71	65.00	9.69
30.00	0.7	4.1	4.1	0.5	7.16	0.42	0.49	0.71	7.62	65.00	8.53
27.50	0.7	4.1	4.2	0.6	7.83	0.42	0.49	0.69	8.29	65.00	7.85
25.00	0.7	4.1	4.2	0.7	8.42	0.42	0.49	0.66	8.87	65.00	7.32
22.50	0.7	4.1	4.2	0.7	8.93	0.42	0.49	0.64	9.38	65.00	6.93
20.00	0.7	4.1	4.2	0.7	9.36	0.42	0.49	0.61	9.81	65.00	6.63
20.00	0.7	4.1	4.2	0.7	9.42	0.41	0.51	0.63	9.86	65.00	6.59
17.50	0.7	4.1	4.2	0.7	8.97	0.41	0.51	0.66	9.41	65.00	6.91
15.00	0.7	4.1	4.2	0.7	8.43	0.41	0.51	0.68	8.88	65.00	7.32
12.50	0.7	4.1	4.2	0.6	7.82	0.41	0.51	0.71	8.27	65.00	7.86
10.00	0.7	4.1	4.1	0.5	7.13	0.41	0.51	0.73	7.58	65.00	8.58
7.00	0.7	4.0	4.1	0.4	6.19	0.41	0.51	0.77	6.64	65.00	9.79
7.00	0.7	4.0	4.1	0.4	6.24	0.41	1.50	2.01	7.03	65.00	9.24
5.00	0.7	3.9	4.0	0.3	4.91	0.41	1.50	2.03	5.78	65.00	11.24
2.50	0.7	3.9	3.9	0.2	4.06	0.41	1.50	2.06	5.04	65.00	12.89
0.00	0.7	3.8	3.9	0.0	3.26	0.41	1.50	2.08	4.60	65.00	14.13

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.7	1.8	0.0	1.82	0.03	0.20	0.66	2.17	65.00	29.90
37.50	0.3	1.8	1.8	0.1	2.41	0.03	0.20	0.63	2.65	65.00	24.50
35.00	0.3	1.8	1.8	0.2	3.48	0.03	0.20	0.60	3.56	65.00	18.25
33.00	0.3	1.8	1.9	0.3	4.48	0.03	0.20	0.58	4.55	65.00	14.30
33.00	0.3	1.8	1.9	0.3	4.46	0.04	0.06	0.28	4.51	65.00	14.42
30.00	0.3	1.9	1.9	0.4	5.23	0.04	0.06	0.25	5.28	65.00	12.31
27.50	0.3	1.9	1.9	0.5	5.79	0.04	0.06	0.22	5.83	65.00	11.15
25.00	0.3	1.9	1.9	0.5	6.26	0.04	0.06	0.20	6.30	65.00	10.32
22.50	0.3	1.9	2.0	0.6	6.64	0.04	0.06	0.17	6.69	65.00	9.72
20.00	0.3	1.9	2.0	0.6	6.95	0.04	0.06	0.14	6.99	65.00	9.30
20.00	0.3	1.9	2.0	0.6	6.93	0.05	0.08	0.16	6.98	65.00	9.31
17.50	0.3	1.9	2.0	0.6	6.63	0.05	0.08	0.18	6.68	65.00	9.72
15.00	0.3	1.9	1.9	0.5	6.25	0.05	0.08	0.21	6.30	65.00	10.31
12.50	0.3	1.9	1.9	0.5	5.79	0.05	0.08	0.24	5.84	65.00	11.13
10.00	0.3	1.9	1.9	0.4	5.24	0.05	0.08	0.26	5.29	65.00	12.28
7.00	0.3	1.8	1.9	0.3	4.47	0.05	0.08	0.29	4.53	65.00	14.36
7.00	0.3	1.8	1.9	0.3	4.46	0.05	0.22	0.60	4.55	65.00	14.28
5.00	0.3	1.8	1.8	0.2	3.46	0.05	0.22	0.62	3.57	65.00	18.19
2.50	0.3	1.8	1.8	0.1	2.40	0.05	0.22	0.64	2.67	65.00	24.33
0.00	0.3	1.7	1.8	0.0	1.80	0.05	0.22	0.67	2.19	65.00	29.70

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	720	2656	2751	1212
60.00	164	-43	170	0	722	2761	2854	1671
55.00	333	-87	344	0	724	2871	2961	2157
50.00	509	-130	525	0	726	2987	3074	2667
48.00	581	-148	600	0	727	3036	3121	2878
48.00	581	-148	600	0	727	3035	3121	2879
45.00	692	-174	713	0	729	3113	3197	3362
45.00	695	-362	784	1364	-901	24191	24208	9953
40.00	2151	-307	2173	1364	-927	24310	24328	10821
35.00	3614	-251	3622	1364	-945	24431	24450	11731
32.00	4495	-217	4500	1364	-943	24517	24535	12273
32.00	4301	-217	4307	1164	5139	25051	25573	16476
30.00	4903	-340	4915	1164	5140	25109	25630	16845
30.00	4906	-340	4918	1164	5127	25297	25812	17364
25.00	6429	-646	6461	1164	5111	25404	25913	18375
21.25	7574	-876	7625	1164	5113	25516	26023	19112
21.25	7545	-876	7596	1071	4486	26036	26420	22397
20.00	7936	-943	7992	1071	4473	26031	26413	22699
15.00	9502	-1210	9579	1071	4452	26109	26486	23811
10.00	11074	-1476	11172	1071	4431	26181	26553	24966
5.00	12649	-1741	12769	1071	4409	26247	26615	26161
0.00	14229	-2005	14370	1071	4410	26405	26771	27300

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	687	2664	2751	1212
60.00	165	-41	170	0	687	2770	2853	1672
55.00	334	-82	344	0	687	2880	2961	2157
50.00	511	-124	525	0	687	2996	3074	2668
48.00	583	-140	600	0	687	3044	3121	2878
48.00	583	-140	600	0	687	3044	3120	2879
45.00	694	-165	713	0	688	3121	3196	3362
45.00	694	1076	1281	-1371	9560	24239	26056	14310
40.00	2153	502	2210	-1371	9593	24342	26164	15175
35.00	3617	-75	3618	-1371	9614	24450	26272	16084
32.00	4499	-421	4519	-1371	9615	24535	26352	16627
32.00	4305	-421	4326	-1174	3551	25079	25329	20860
30.00	4908	-506	4934	-1174	3551	25137	25387	21229
30.00	4911	-507	4937	-1174	3560	25313	25562	21748
25.00	6434	-721	6474	-1174	3571	25404	25654	22759
21.25	7580	-882	7631	-1174	3572	25516	25765	23495
21.25	7550	-883	7602	-1083	4204	26035	26372	26778
20.00	7941	-946	7997	-1082	4206	26018	26356	27081
15.00	9507	-1200	9582	-1082	4209	26077	26415	28193
10.00	11076	-1453	11171	-1082	4208	26130	26467	29347
5.00	12648	-1707	12763	-1082	4204	26178	26514	30542
0.00	14224	-1959	14358	-1082	4205	26336	26670	31681

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1364	-188	1377	-3	-6580	21086	22088	1595
37.50	-733	7	733	-3	-6393	21029	21979	1595
35.00	-103	196	221	-3	-6206	20974	21873	1566
33.00	400	343	527	-3	-6057	20929	21787	1567
33.00	400	343	527	-2	-1212	7201	7302	4101
30.00	658	382	761	-2	-985	7128	7195	4111
27.50	871	409	963	-2	-796	7065	7109	4122
25.00	1082	430	1165	-2	-607	7000	7026	4135
22.50	1291	446	1366	-2	-417	6934	6947	4151
20.00	1499	455	1566	-2	-231	6877	6881	4151
20.00	1499	455	1566	-1	4625	-6882	8292	6544
17.50	1291	314	1329	-1	4811	-6939	8444	6543
15.00	1082	167	1095	-1	5001	-7010	8611	6525
12.50	870	14	870	-1	5189	-7079	8777	6510
10.00	657	-145	673	-1	5376	-7145	8942	6500
7.00	398	-342	525	-1	5597	-7222	9137	6492
7.00	398	-342	525	0	10447	-20992	23447	8767
5.00	-106	-595	604	0	10587	-21035	23549	8782
2.50	-738	-915	1176	0	10760	-21081	23668	8825
0.00	-1371	-1241	1849	0	10946	-21138	23804	8825

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	200	0	200	194	-4162	550	4198	-6104
37.50	216	122	248	194	-3977	494	4008	-6102
35.00	230	239	331	194	-3793	439	3818	-6099
33.00	240	328	406	194	-3643	394	3665	-6099
33.00	240	328	406	64	-1848	312	1874	-6090
30.00	250	390	463	64	-1624	245	1643	-6089
27.50	257	436	506	64	-1442	191	1455	-6087
25.00	262	477	544	64	-1260	138	1267	-6086
22.50	265	512	576	64	-1078	84	1081	-6084
20.00	267	542	604	64	-897	31	897	-6083
20.00	267	542	604	-65	897	-49	898	-6083
17.50	265	512	576	-65	1078	-102	1083	-6084
15.00	261	477	543	-65	1260	-155	1269	-6086
12.50	255	436	505	-65	1442	-209	1457	-6087
10.00	248	390	462	-65	1624	-262	1645	-6089
7.00	237	328	405	-65	1848	-329	1877	-6090
7.00	237	328	405	-195	3643	-411	3667	-6099
5.00	227	239	329	-195	3793	-456	3820	-6099
2.50	212	122	245	-195	3977	-512	4010	-6102
0.00	196	0	196	-195	4162	-567	4201	-6104

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	93	0	93	30	-3248	548	3294	610
37.50	109	95	144	30	-3061	492	3101	612
35.00	123	184	221	30	-2874	437	2907	613
33.00	133	251	284	30	-2725	393	2753	614
33.00	133	251	284	10	-1557	320	1590	618
30.00	143	303	335	10	-1333	254	1357	620
27.50	150	340	372	10	-1145	198	1162	621
25.00	155	372	403	10	-958	143	969	622
22.50	158	398	428	10	-771	88	776	622
20.00	160	418	448	10	-584	33	585	622
20.00	160	418	448	-10	584	-40	585	622
17.50	158	398	428	-10	771	-95	777	622
15.00	155	372	402	-10	958	-150	970	622
12.50	149	340	371	-10	1145	-206	1164	621
10.00	142	303	335	-10	1333	-261	1358	620
7.00	132	251	283	-10	1557	-327	1591	618
7.00	132	251	283	-30	2725	-400	2754	614
5.00	121	184	220	-30	2874	-444	2908	613
2.50	107	95	143	-30	3061	-499	3102	612
0.00	91	0	91	-30	3248	-555	3295	610

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.7	13.5	13.6	0.2	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	1.5	12.0	12.1	0.1	1.64	0.09	0.00	0.31	1.73	65.00	37.67
55.00	1.3	10.5	10.6	0.1	2.99	0.11	0.00	0.31	3.10	65.00	20.99
50.00	1.1	9.0	9.1	0.1	4.12	0.13	0.00	0.30	4.25	65.00	15.28
48.00	1.0	8.4	8.5	0.1	4.53	0.14	0.00	0.30	4.67	65.00	13.93
48.00	1.0	8.4	8.5	0.1	3.06	0.09	0.00	0.20	3.16	65.00	20.60
45.00	0.9	7.6	7.6	0.1	3.44	0.11	0.00	0.20	3.55	65.00	18.32
45.00	0.9	7.6	7.6	0.1	3.69	0.31	3.21	4.74	8.63	65.00	7.53
40.00	0.8	6.2	6.2	0.1	9.50	0.32	2.93	4.40	11.42	65.00	5.69
35.00	0.6	4.8	4.9	0.0	14.35	0.34	2.69	4.10	15.64	65.00	4.16
32.00	0.5	4.1	4.1	0.0	16.88	0.34	2.56	3.94	17.97	65.00	3.62
32.00	0.5	4.1	4.1	0.0	16.16	0.46	2.18	3.62	17.08	65.00	3.81
30.00	0.5	3.6	3.7	0.0	17.91	0.46	2.11	3.53	18.76	65.00	3.46
30.00	0.5	3.6	3.7	0.0	17.92	0.48	2.11	3.54	18.79	65.00	3.46
25.00	0.3	2.6	2.6	0.0	21.85	0.48	1.95	3.33	22.61	65.00	2.87
21.25	0.3	1.9	1.9	0.0	24.39	0.49	1.84	3.18	25.10	65.00	2.59
21.25	0.3	1.9	1.9	0.0	24.30	0.57	1.69	3.05	25.07	65.00	2.59
20.00	0.2	1.7	1.7	0.0	25.09	0.58	1.66	3.01	25.85	65.00	2.51
15.00	0.1	1.0	1.0	0.0	27.95	0.58	1.54	2.85	28.68	65.00	2.27
10.00	0.1	0.4	0.4	0.0	30.37	0.59	1.44	2.70	31.08	65.00	2.09
5.00	0.0	0.1	0.1	0.0	32.41	0.60	1.34	2.56	33.10	65.00	1.96
0.00	0.0	0.0	0.0	0.0	34.13	0.60	1.25	2.44	34.81	65.00	1.87

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.4	13.5	13.6	0.2	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	1.3	12.0	12.1	0.1	1.63	0.09	0.00	0.31	1.73	65.00	37.67
55.00	1.2	10.5	10.6	0.1	2.98	0.11	0.00	0.31	3.10	65.00	21.00
50.00	1.0	9.0	9.1	0.1	4.12	0.13	0.00	0.30	4.25	65.00	15.29
48.00	1.0	8.4	8.5	0.1	4.53	0.14	0.00	0.30	4.67	65.00	13.93
48.00	1.0	8.4	8.5	0.1	3.06	0.09	0.00	0.20	3.15	65.00	20.61
45.00	0.9	7.6	7.6	0.1	3.44	0.11	0.00	0.20	3.55	65.00	18.33
45.00	0.9	7.6	7.6	0.1	6.04	0.45	3.23	4.86	10.57	65.00	6.15
40.00	0.8	6.2	6.2	0.1	9.73	0.45	2.95	4.52	12.21	65.00	5.32
35.00	0.6	4.8	4.9	0.0	14.18	0.46	2.70	4.21	15.78	65.00	4.12
32.00	0.5	4.1	4.1	0.0	17.10	0.46	2.57	4.05	18.19	65.00	3.57
32.00	0.5	4.1	4.1	0.0	16.38	0.58	2.20	3.62	17.32	65.00	3.75
30.00	0.5	3.6	3.7	0.0	18.09	0.58	2.13	3.53	18.98	65.00	3.43
30.00	0.5	3.6	3.7	0.0	18.10	0.60	2.13	3.54	19.00	65.00	3.42
25.00	0.3	2.6	2.6	0.0	21.94	0.60	1.97	3.32	22.75	65.00	2.86
21.25	0.3	1.9	1.9	0.0	24.41	0.60	1.86	3.18	25.18	65.00	2.58
21.25	0.3	1.9	1.9	0.0	24.32	0.69	1.71	3.07	25.15	65.00	2.58
20.00	0.2	1.7	1.7	0.0	25.11	0.69	1.68	3.02	25.93	65.00	2.51
15.00	0.1	1.0	1.0	0.0	27.96	0.69	1.56	2.86	28.75	65.00	2.26
10.00	0.1	0.4	0.4	0.0	30.36	0.69	1.45	2.71	31.14	65.00	2.09
5.00	0.0	0.1	0.1	0.0	32.39	0.70	1.36	2.57	33.15	65.00	1.96
0.00	0.0	0.0	0.0	0.0	34.09	0.70	1.27	2.45	34.84	65.00	1.87

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESc Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.9	7.6	7.6	0.1	21.20	0.11	0.02	3.09	21.31	65.00	3.05
37.50	0.9	7.8	7.8	0.2	10.81	0.11	0.02	3.07	11.44	65.00	5.68
35.00	0.9	8.0	8.1	0.3	3.50	0.11	0.02	3.06	6.40	65.00	10.15
33.00	0.9	8.2	8.3	0.3	7.97	0.11	0.02	3.05	8.64	65.00	7.52
33.00	0.9	8.2	8.3	0.3	7.97	0.28	0.02	1.03	8.26	65.00	7.87
30.00	0.9	8.5	8.6	0.4	12.00	0.28	0.02	1.02	12.29	65.00	5.29
27.50	0.9	8.7	8.8	0.5	15.30	0.28	0.02	1.00	15.59	65.00	4.17
25.00	0.9	8.9	8.9	0.5	18.53	0.28	0.02	0.99	18.82	65.00	3.45
22.50	0.9	9.0	9.0	0.5	21.70	0.28	0.02	0.98	21.99	65.00	2.96
20.00	0.9	9.0	9.1	0.5	24.80	0.28	0.02	0.98	25.09	65.00	2.59
20.00	0.9	9.0	9.1	0.5	24.80	0.44	0.01	1.16	25.25	65.00	2.57
17.50	0.9	9.0	9.0	0.4	20.89	0.44	0.01	1.19	21.34	65.00	3.05
15.00	0.9	8.9	8.9	0.3	16.92	0.44	0.01	1.21	17.37	65.00	3.74
12.50	0.9	8.7	8.8	0.3	12.88	0.44	0.01	1.23	13.33	65.00	4.88
10.00	0.9	8.5	8.6	0.2	10.54	0.44	0.01	1.25	11.14	65.00	5.84
7.00	0.9	8.2	8.3	0.1	7.94	0.44	0.01	1.28	8.60	65.00	7.56
7.00	0.9	8.2	8.3	0.1	7.94	0.60	0.00	3.26	9.92	65.00	6.55
5.00	0.9	8.0	8.1	0.1	9.39	0.60	0.00	3.27	10.66	65.00	6.10
2.50	0.9	7.8	7.8	0.1	17.95	0.60	0.00	3.29	18.91	65.00	3.44
0.00	0.9	7.6	7.6	0.1	27.71	0.60	0.00	3.30	28.32	65.00	2.30

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	4.1	4.1	0.0	2.94	0.42	1.49	2.07	4.39	65.00	14.82
37.50	0.5	4.2	4.2	0.2	3.91	0.41	1.49	2.04	4.89	65.00	13.29
35.00	0.5	4.3	4.3	0.3	4.91	0.41	1.49	2.02	5.81	65.00	11.20
33.00	0.5	4.3	4.4	0.4	6.28	0.41	1.49	2.00	7.09	65.00	9.17
33.00	0.5	4.3	4.4	0.4	6.28	0.41	0.49	0.75	6.73	65.00	9.65
30.00	0.5	4.4	4.4	0.5	7.26	0.41	0.49	0.72	7.71	65.00	8.43
27.50	0.5	4.4	4.5	0.6	7.97	0.41	0.49	0.70	8.42	65.00	7.72
25.00	0.5	4.5	4.5	0.7	8.60	0.41	0.49	0.67	9.05	65.00	7.18
22.50	0.5	4.5	4.5	0.7	9.14	0.41	0.49	0.64	9.58	65.00	6.78
20.00	0.5	4.5	4.5	0.7	9.59	0.41	0.49	0.62	10.03	65.00	6.48
20.00	0.5	4.5	4.5	0.7	9.59	0.41	0.50	0.63	10.03	65.00	6.48
17.50	0.5	4.5	4.5	0.7	9.14	0.41	0.50	0.65	9.58	65.00	6.78
15.00	0.5	4.5	4.5	0.7	8.60	0.41	0.50	0.68	9.04	65.00	7.19
12.50	0.5	4.4	4.5	0.6	7.97	0.41	0.50	0.70	8.42	65.00	7.72
10.00	0.5	4.4	4.4	0.5	7.24	0.41	0.50	0.73	7.70	65.00	8.44
7.00	0.5	4.3	4.4	0.4	6.26	0.41	0.50	0.76	6.72	65.00	9.67
7.00	0.5	4.3	4.4	0.4	6.26	0.41	1.49	2.00	7.08	65.00	9.19
5.00	0.5	4.3	4.3	0.3	4.89	0.41	1.49	2.02	5.79	65.00	11.22
2.50	0.5	4.2	4.2	0.2	3.86	0.41	1.49	2.05	4.86	65.00	13.38
0.00	0.5	4.1	4.1	0.0	2.88	0.42	1.49	2.08	4.36	65.00	14.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.9	1.9	0.0	1.37	0.04	0.23	0.69	1.84	65.00	35.23
37.50	0.3	1.9	1.9	0.1	2.18	0.04	0.23	0.66	2.44	65.00	26.59
35.00	0.3	2.0	2.0	0.2	3.45	0.04	0.23	0.63	3.53	65.00	18.39
33.00	0.3	2.0	2.0	0.3	4.50	0.04	0.23	0.61	4.57	65.00	14.22
33.00	0.3	2.0	2.0	0.3	4.50	0.04	0.07	0.30	4.54	65.00	14.31
30.00	0.3	2.1	2.1	0.4	5.32	0.04	0.07	0.26	5.37	65.00	12.11
27.50	0.3	2.1	2.1	0.5	5.91	0.04	0.07	0.24	5.96	65.00	10.91
25.00	0.3	2.1	2.1	0.5	6.41	0.04	0.07	0.21	6.45	65.00	10.08
22.50	0.3	2.1	2.1	0.6	6.81	0.04	0.07	0.18	6.85	65.00	9.48
20.00	0.3	2.1	2.1	0.6	7.12	0.04	0.07	0.16	7.16	65.00	9.07
20.00	0.3	2.1	2.1	0.6	7.12	0.04	0.08	0.16	7.16	65.00	9.07
17.50	0.3	2.1	2.1	0.6	6.81	0.04	0.08	0.19	6.85	65.00	9.49
15.00	0.3	2.1	2.1	0.5	6.40	0.04	0.08	0.21	6.45	65.00	10.08
12.50	0.3	2.1	2.1	0.5	5.91	0.04	0.08	0.24	5.95	65.00	10.92
10.00	0.3	2.1	2.1	0.4	5.32	0.04	0.08	0.27	5.36	65.00	12.12
7.00	0.3	2.0	2.0	0.3	4.49	0.04	0.08	0.30	4.54	65.00	14.33
7.00	0.3	2.0	2.0	0.3	4.49	0.04	0.23	0.61	4.57	65.00	14.24
5.00	0.3	2.0	2.0	0.2	3.44	0.04	0.23	0.63	3.53	65.00	18.43
2.50	0.3	1.9	1.9	0.1	2.15	0.04	0.23	0.66	2.43	65.00	26.79
0.00	0.3	1.9	1.9	0.0	1.34	0.04	0.23	0.69	1.83	65.00	35.54

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	736	2403	2513	346
60.00	144	-49	152	0	832	2409	2548	805
55.00	289	-102	306	0	932	2415	2588	1290
50.00	434	-161	463	0	1038	2420	2633	1801
48.00	492	-186	526	0	1082	2423	2653	2011
48.00	492	-186	526	0	1081	2423	2653	2012
45.00	580	-226	622	0	1149	2428	2686	2495
45.00	581	330	668	646	3793	12328	12898	202
40.00	1321	99	1325	646	3910	12338	12943	1038
35.00	2062	-138	2066	646	4021	12349	12987	1932
32.00	2506	-285	2522	646	4097	12354	13016	2474
32.00	2313	-284	2331	539	4277	12332	13053	6683
30.00	2609	-388	2638	539	4328	12336	13073	7052
30.00	2609	-391	2638	539	4532	12334	13141	7541
25.00	3350	-666	3415	539	4659	12333	13184	8507
21.25	3905	-878	4002	539	4762	12339	13226	9244
21.25	3879	-878	3977	480	4924	12344	13290	12518
20.00	4064	-952	4174	480	4954	12334	13291	12782
15.00	4804	-1254	4965	480	5088	12318	13327	13829
10.00	5543	-1563	5759	480	5225	12298	13362	14916
5.00	6281	-1881	6557	480	5366	12274	13396	16041
0.00	7018	-2207	7357	480	5522	12275	13460	17180

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	722	2407	2513	346
60.00	145	-48	152	0	818	2413	2548	805
55.00	290	-100	306	0	919	2420	2588	1290
50.00	435	-158	463	0	1024	2426	2634	1801
48.00	493	-183	526	0	1068	2429	2653	2011
48.00	493	-183	526	0	1068	2429	2653	2012
45.00	581	-223	622	0	1135	2435	2687	2495
45.00	579	313	659	-645	3671	12334	12869	4767
40.00	1320	89	1323	-645	3795	12338	12909	5613
35.00	2060	-142	2065	-645	3921	12341	12949	6498
32.00	2505	-285	2521	-645	3997	12347	12978	7040
32.00	2310	-285	2328	-538	4201	12446	13136	11248
30.00	2609	-386	2637	-538	4253	12450	13156	11617
30.00	2609	-390	2638	-538	4462	12443	13219	12107
25.00	3356	-662	3420	-538	4594	12434	13256	13073
21.25	3915	-871	4011	-538	4697	12440	13297	13810
21.25	3888	-871	3984	-479	4679	12463	13384	17062
20.00	4074	-944	4182	-479	4912	12447	13381	17326
15.00	4821	-1243	4979	-479	5049	12422	13408	18374
10.00	5567	-1551	5779	-479	5189	12392	13434	19461
5.00	6310	-1867	6581	-479	5332	12358	13459	20586
0.00	7052	-2192	7385	-479	5488	12359	13523	21725

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-646	556	853	-1	2296	9898	10161	-2653
37.50	-349	485	597	-1	2482	9894	10200	-2660
35.00	-52	408	411	-1	2668	9892	10245	-2663
33.00	185	342	389	-1	2818	9890	10283	-2663
33.00	185	343	389	-1	1810	3309	3772	-911
30.00	304	273	409	-1	2035	3306	3883	-911
27.50	403	210	455	-1	2222	3305	3983	-910
25.00	502	140	522	-1	2410	3303	4089	-909
22.50	602	65	605	-1	2597	3302	4201	-907
20.00	701	-16	701	-1	2785	3300	4318	-904
20.00	701	-15	701	-1	1781	-3288	3739	824
17.50	602	-71	606	-1	1969	-3290	3834	824
15.00	503	-133	520	-1	2156	-3293	3936	820
12.50	404	-200	451	-1	2344	-3296	4045	818
10.00	305	-273	410	-1	2531	-3299	4158	816
7.00	187	-369	413	-1	2756	-3303	4302	816
7.00	187	-368	412	-1	1748	-9898	10051	2517
5.00	-51	-411	414	-1	1896	-9900	10080	2519
2.50	-348	-471	586	-1	2082	-9901	10117	2527
0.00	-645	-536	839	-1	2269	-9903	10160	2527

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	107	0	107	193	-4200	-21	4200	-192
37.50	106	123	163	193	-4013	-25	4013	-190
35.00	105	241	263	193	-3826	-28	3826	-188
33.00	105	331	347	193	-3676	-29	3676	-188
33.00	115	331	350	64	-1876	-46	1877	-58
30.00	113	394	410	64	-1651	-48	1652	-56
27.50	111	441	455	64	-1464	-50	1465	-54
25.00	110	482	494	64	-1276	-51	1277	-53
22.50	108	517	529	64	-1089	-53	1090	-51
20.00	107	547	558	64	-901	-55	903	-51
20.00	116	547	559	-66	899	-69	901	70
17.50	114	517	530	-66	1086	-71	1089	70
15.00	112	482	495	-66	1274	-73	1276	69
12.50	110	441	454	-66	1462	-75	1464	67
10.00	107	394	409	-66	1650	-76	1651	66
7.00	105	331	347	-66	1875	-79	1877	64
7.00	114	331	350	-195	3676	-96	3677	176
5.00	111	241	265	-195	3826	-97	3827	176
2.50	108	123	164	-195	4014	-101	4015	174
0.00	105	0	105	-195	4202	-104	4203	172

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	59	0	59	26	-3263	12	3263	-171
37.50	59	95	112	26	-3076	10	3076	-170
35.00	60	185	194	26	-2889	9	2889	-168
33.00	60	252	259	26	-2739	8	2739	-168
33.00	62	250	258	8	-1571	0	1571	-51
30.00	62	303	309	8	-1346	-2	1346	-51
27.50	62	340	346	8	-1158	-3	1158	-50
25.00	61	372	377	8	-971	-4	971	-49
22.50	61	399	403	8	-783	-6	783	-48
20.00	61	419	424	8	-596	-7	596	-47
20.00	63	418	422	-10	573	-15	573	65
17.50	62	398	402	-10	760	-16	760	65
15.00	62	372	377	-10	948	-18	948	64
12.50	61	341	346	-10	1136	-19	1136	63
10.00	61	304	310	-10	1324	-20	1324	62
7.00	60	252	259	-10	1549	-22	1549	61
7.00	62	250	258	-28	2718	-30	2718	168
5.00	61	183	193	-28	2868	-31	2868	168
2.50	60	94	112	-28	3056	-33	3056	166
0.00	59	0	59	-28	3244	-35	3244	165

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.6	7.1	7.2	0.0	0.02	0.02	0.00	0.29	0.50	65.00	99.90
60.00	1.5	6.2	6.4	0.0	1.46	0.04	0.00	0.28	1.51	65.00	43.10
55.00	1.3	5.4	5.6	0.0	2.65	0.07	0.00	0.27	2.72	65.00	23.93
50.00	1.1	4.6	4.7	0.0	3.62	0.09	0.00	0.26	3.71	65.00	17.54
48.00	1.1	4.3	4.4	0.0	3.95	0.10	0.00	0.26	4.05	65.00	16.04
48.00	1.1	4.3	4.4	0.0	2.67	0.06	0.00	0.17	2.74	65.00	23.72
45.00	1.0	3.9	4.0	0.0	2.98	0.08	0.00	0.17	3.06	65.00	21.22
45.00	1.0	3.9	4.0	0.0	3.12	0.01	1.52	2.33	4.97	65.00	13.08
40.00	0.8	3.1	3.2	0.0	5.73	0.03	1.39	2.17	6.51	65.00	9.99
35.00	0.7	2.4	2.5	0.0	8.18	0.06	1.27	2.02	8.51	65.00	7.64
32.00	0.6	2.1	2.1	0.0	9.57	0.07	1.21	1.94	9.85	65.00	6.60
32.00	0.6	2.1	2.1	0.0	8.86	0.19	1.01	1.74	9.19	65.00	7.07
30.00	0.5	1.8	1.9	0.0	9.73	0.19	0.98	1.70	10.05	65.00	6.47
30.00	0.5	1.8	1.9	0.0	9.73	0.21	0.98	1.70	10.06	65.00	6.46
25.00	0.4	1.3	1.3	0.0	11.68	0.22	0.90	1.60	11.99	65.00	5.42
21.25	0.3	0.9	1.0	0.0	12.93	0.24	0.85	1.53	13.23	65.00	4.91
21.25	0.3	0.9	1.0	0.0	12.85	0.32	0.76	1.44	13.22	65.00	4.92
20.00	0.2	0.8	0.9	0.0	13.23	0.32	0.74	1.42	13.61	65.00	4.78
15.00	0.1	0.5	0.5	0.0	14.62	0.34	0.69	1.34	15.00	65.00	4.33
10.00	0.1	0.2	0.2	0.0	15.79	0.35	0.64	1.28	16.17	65.00	4.02
5.00	0.0	0.1	0.1	0.0	16.77	0.37	0.60	1.21	17.16	65.00	3.79
0.00	0.0	0.0	0.0	0.0	17.59	0.38	0.56	1.16	17.98	65.00	3.61

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.6	7.1	7.3	0.0	0.02	0.02	0.00	0.29	0.50	65.00	99.90
60.00	1.5	6.2	6.4	0.0	1.46	0.04	0.00	0.28	1.51	65.00	43.09
55.00	1.3	5.4	5.6	0.0	2.65	0.07	0.00	0.27	2.72	65.00	23.92
50.00	1.1	4.6	4.8	0.0	3.62	0.09	0.00	0.26	3.71	65.00	17.53
48.00	1.1	4.3	4.4	0.0	3.96	0.10	0.00	0.26	4.05	65.00	16.03
48.00	1.1	4.3	4.4	0.0	2.68	0.06	0.00	0.17	2.74	65.00	23.71
45.00	1.0	3.9	4.0	0.0	2.99	0.08	0.00	0.17	3.06	65.00	21.21
45.00	1.0	3.9	4.0	0.0	3.09	0.15	1.52	2.33	5.02	65.00	12.96
40.00	0.8	3.1	3.2	0.0	5.72	0.17	1.39	2.17	6.66	65.00	9.76
35.00	0.7	2.4	2.5	0.0	8.18	0.19	1.27	2.02	8.67	65.00	7.50
32.00	0.6	2.1	2.1	0.0	9.57	0.20	1.21	1.94	10.00	65.00	6.50
32.00	0.6	2.1	2.1	0.0	8.85	0.31	1.01	1.75	9.34	65.00	6.96
30.00	0.5	1.8	1.9	0.0	9.73	0.32	0.98	1.70	10.20	65.00	6.37
30.00	0.5	1.8	1.9	0.0	9.73	0.33	0.98	1.71	10.22	65.00	6.36
25.00	0.4	1.3	1.3	0.0	11.69	0.34	0.90	1.60	12.15	65.00	5.35
21.25	0.3	0.9	1.0	0.0	12.96	0.35	0.85	1.54	13.40	65.00	4.85
21.25	0.3	0.9	1.0	0.0	12.87	0.44	0.76	1.45	13.38	65.00	4.86
20.00	0.2	0.8	0.9	0.0	13.26	0.44	0.74	1.43	13.77	65.00	4.72
15.00	0.1	0.5	0.5	0.0	14.66	0.45	0.69	1.35	15.17	65.00	4.28
10.00	0.1	0.2	0.2	0.0	15.84	0.46	0.64	1.28	16.35	65.00	3.98
5.00	0.0	0.1	0.1	0.0	16.83	0.47	0.60	1.22	17.34	65.00	3.75
0.00	0.0	0.0	0.0	0.0	17.66	0.48	0.56	1.16	18.17	65.00	3.58

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.0	3.9	4.0	0.0	12.88	0.18	0.01	1.43	13.07	65.00	4.97
37.50	1.0	4.0	4.1	0.1	9.25	0.18	0.01	1.43	9.63	65.00	6.75
35.00	1.0	4.1	4.2	0.1	6.31	0.18	0.01	1.44	6.77	65.00	9.60
33.00	1.0	4.2	4.3	0.1	6.15	0.18	0.01	1.44	6.79	65.00	9.58
33.00	1.0	4.2	4.3	0.1	6.16	0.06	0.01	0.54	6.29	65.00	10.34
30.00	1.0	4.3	4.4	0.1	6.14	0.06	0.01	0.55	6.24	65.00	10.41
27.50	1.0	4.4	4.5	0.1	7.21	0.06	0.01	0.57	7.31	65.00	8.89
25.00	1.0	4.5	4.6	0.1	8.24	0.06	0.01	0.58	8.34	65.00	7.79
22.50	1.0	4.5	4.6	0.1	9.24	0.06	0.01	0.60	9.34	65.00	6.96
20.00	1.0	4.5	4.6	0.0	10.39	0.06	0.01	0.61	10.46	65.00	6.21
20.00	1.0	4.5	4.6	0.0	10.39	0.06	0.01	0.53	10.47	65.00	6.21
17.50	1.0	4.5	4.6	0.0	9.28	0.06	0.01	0.55	9.37	65.00	6.94
15.00	1.0	4.5	4.6	0.0	8.21	0.06	0.01	0.56	8.30	65.00	7.83
12.50	1.0	4.4	4.5	-0.1	7.16	0.06	0.01	0.58	7.27	65.00	8.94
10.00	1.0	4.3	4.4	-0.1	6.15	0.06	0.01	0.59	6.27	65.00	10.36
7.00	1.0	4.2	4.3	-0.1	6.55	0.06	0.01	0.61	6.69	65.00	9.72
7.00	1.0	4.2	4.3	-0.1	6.54	0.17	0.01	1.41	7.12	65.00	9.13
5.00	1.0	4.1	4.2	-0.1	6.36	0.17	0.01	1.42	6.84	65.00	9.50
2.50	1.0	4.0	4.1	0.0	9.04	0.17	0.01	1.42	9.44	65.00	6.89
0.00	1.0	3.9	4.0	0.0	12.75	0.17	0.01	1.43	12.93	65.00	5.03

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	2.1	2.1	0.0	1.57	0.01	1.48	2.07	3.91	65.00	16.64
37.50	0.6	2.1	2.2	0.2	2.46	0.01	1.48	2.04	4.16	65.00	15.64
35.00	0.6	2.1	2.2	0.3	4.18	0.01	1.48	2.02	5.09	65.00	12.76
33.00	0.6	2.2	2.2	0.4	5.50	0.01	1.48	1.99	6.21	65.00	10.46
33.00	0.6	2.2	2.2	0.4	5.56	0.00	0.49	0.75	5.65	65.00	11.51
30.00	0.6	2.2	2.3	0.5	6.48	0.00	0.49	0.72	6.56	65.00	9.92
27.50	0.6	2.2	2.3	0.6	7.16	0.00	0.49	0.69	7.22	65.00	9.00
25.00	0.6	2.2	2.3	0.7	7.75	0.00	0.49	0.67	7.81	65.00	8.32
22.50	0.6	2.2	2.3	0.7	8.27	0.00	0.49	0.64	8.32	65.00	7.81
20.00	0.6	2.2	2.3	0.7	8.69	0.00	0.49	0.61	8.74	65.00	7.44
20.00	0.6	2.2	2.3	0.7	8.75	0.00	0.50	0.63	8.81	65.00	7.38
17.50	0.6	2.2	2.3	0.7	8.30	0.00	0.50	0.66	8.36	65.00	7.77
15.00	0.6	2.2	2.3	0.7	7.77	0.00	0.50	0.68	7.83	65.00	8.30
12.50	0.6	2.2	2.3	0.6	7.15	0.00	0.50	0.71	7.22	65.00	9.00
10.00	0.6	2.2	2.3	0.5	6.45	0.00	0.50	0.73	6.53	65.00	9.95
7.00	0.6	2.2	2.2	0.4	5.50	0.00	0.50	0.77	5.60	65.00	11.61
7.00	0.6	2.2	2.2	0.4	5.56	0.01	1.50	2.01	6.28	65.00	10.35
5.00	0.6	2.1	2.2	0.3	4.22	0.01	1.50	2.03	5.14	65.00	12.64
2.50	0.6	2.1	2.2	0.2	2.47	0.01	1.50	2.06	4.20	65.00	15.47
0.00	0.6	2.1	2.1	0.0	1.55	0.01	1.50	2.08	3.93	65.00	16.53

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.9	1.0	0.0	0.87	0.01	0.20	0.66	1.43	65.00	45.61
37.50	0.3	1.0	1.0	0.1	1.76	0.01	0.20	0.63	1.86	65.00	34.98
35.00	0.3	1.0	1.0	0.2	3.08	0.01	0.20	0.61	3.13	65.00	20.79
33.00	0.3	1.0	1.0	0.3	4.07	0.01	0.20	0.58	4.10	65.00	15.84
33.00	0.3	1.0	1.0	0.3	4.06	0.00	0.06	0.28	4.06	65.00	16.01
30.00	0.3	1.0	1.0	0.4	4.83	0.00	0.06	0.25	4.83	65.00	13.46
27.50	0.3	1.0	1.1	0.5	5.38	0.00	0.06	0.22	5.38	65.00	12.08
25.00	0.3	1.0	1.1	0.5	5.85	0.00	0.06	0.20	5.85	65.00	11.11
22.50	0.3	1.0	1.1	0.5	6.23	0.00	0.06	0.17	6.24	65.00	10.42
20.00	0.3	1.0	1.1	0.6	6.54	0.00	0.06	0.15	6.54	65.00	9.94
20.00	0.3	1.0	1.1	0.6	6.52	0.00	0.08	0.16	6.53	65.00	9.96
17.50	0.3	1.0	1.1	0.5	6.22	0.00	0.08	0.18	6.23	65.00	10.43
15.00	0.3	1.0	1.1	0.5	5.84	0.00	0.08	0.21	5.85	65.00	11.11
12.50	0.3	1.0	1.1	0.5	5.38	0.00	0.08	0.23	5.39	65.00	12.06
10.00	0.3	1.0	1.0	0.4	4.84	0.00	0.08	0.26	4.85	65.00	13.41
7.00	0.3	1.0	1.0	0.3	4.07	0.00	0.08	0.29	4.08	65.00	15.92
7.00	0.3	1.0	1.0	0.3	4.06	0.01	0.21	0.59	4.11	65.00	15.80
5.00	0.3	1.0	1.0	0.2	3.07	0.01	0.21	0.62	3.14	65.00	20.70
2.50	0.3	1.0	1.0	0.1	1.75	0.01	0.21	0.64	1.88	65.00	34.58
0.00	0.3	0.9	1.0	0.0	0.87	0.01	0.21	0.67	1.45	65.00	44.79

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	708	2432	2533	342
60.00	151	-43	157	0	709	2533	2630	801
55.00	306	-85	317	0	711	2639	2733	1286
50.00	468	-128	485	0	712	2750	2841	1797
48.00	534	-145	553	0	712	2797	2886	2008
48.00	534	-145	553	0	712	2796	2885	2008
45.00	636	-171	659	0	713	2869	2957	2492
45.00	638	256	688	664	3335	13220	13635	731
40.00	1435	56	1436	664	3337	13347	13757	1566
35.00	2240	-143	2245	664	3326	13477	13882	2464
32.00	2727	-263	2739	664	3327	13558	13960	3007
32.00	2533	-263	2546	583	3304	14095	14477	7211
30.00	2872	-342	2892	583	3304	14150	14531	7580
30.00	2875	-342	2895	583	3301	14355	14729	8071
25.00	3740	-540	3779	583	3297	14483	14854	9041
21.25	4394	-688	4448	583	3298	14591	14959	9778
21.25	4365	-688	4419	554	3293	15111	15466	13040
20.00	4592	-737	4651	554	3289	15133	15486	13308
15.00	5504	-934	5583	554	3282	15254	15603	14363
10.00	6424	-1131	6523	554	3274	15375	15720	15458
5.00	7351	-1327	7470	554	3265	15496	15837	16592
0.00	8286	-1523	8425	554	3266	15653	15990	17731

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	693	2436	2533	342
60.00	151	-42	157	0	694	2537	2630	801
55.00	306	-83	317	0	695	2643	2733	1286
50.00	468	-125	485	0	695	2755	2841	1797
48.00	535	-142	553	0	695	2801	2886	2008
48.00	535	-142	553	0	695	2800	2886	2008
45.00	637	-167	659	0	696	2874	2957	2492
45.00	638	237	680	-667	3175	13241	13616	4191
40.00	1436	46	1437	-667	3184	13361	13735	5038
35.00	2242	-145	2246	-667	3190	13485	13857	5924
32.00	2729	-260	2741	-667	3191	13566	13936	6467
32.00	2535	-260	2548	-587	3230	14108	14473	10671
30.00	2874	-338	2894	-587	3230	14162	14526	11040
30.00	2877	-338	2897	-587	3233	14362	14721	11531
25.00	3743	-532	3780	-587	3236	14484	14841	12501
21.25	4397	-678	4449	-587	3237	14591	14946	13238
21.25	4367	-678	4420	-559	3248	15111	15456	16500
20.00	4594	-727	4651	-559	3248	15128	15473	16768
15.00	5506	-922	5583	-559	3247	15241	15583	17823
10.00	6425	-1117	6522	-559	3245	15354	15693	18918
5.00	7351	-1313	7467	-559	3241	15467	15803	20052
0.00	8284	-1507	8420	-559	3242	15623	15956	21191

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-664	427	789	-2	1765	10349	10499	-2630
37.50	-354	371	513	-2	1950	10293	10476	-2637
35.00	-46	310	313	-2	2136	10237	10458	-2639
33.00	199	257	325	-2	2285	10193	10446	-2639
33.00	199	257	325	-1	1267	3588	3805	-911
30.00	327	207	387	-1	1491	3522	3824	-911
27.50	432	160	460	-1	1678	3467	3852	-910
25.00	535	107	545	-1	1864	3413	3889	-908
22.50	637	48	638	-1	2051	3358	3935	-905
20.00	736	-16	737	-1	2238	3304	3991	-902
20.00	736	-16	737	0	1222	-3309	3527	799
17.50	636	-56	639	0	1409	-3364	3647	799
15.00	535	-101	544	0	1596	-3420	3774	795
12.50	431	-152	457	0	1782	-3476	3906	792
10.00	326	-208	387	0	1969	-3531	4043	790
7.00	198	-283	345	0	2193	-3598	4214	789
7.00	198	-283	345	1	1174	-10218	10285	2461
5.00	-48	-313	316	1	1323	-10262	10347	2462
2.50	-357	-355	503	1	1508	-10316	10425	2470
0.00	-667	-403	779	1	1695	-10371	10508	2470

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	81	0	81	194	-4195	539	4230	9
37.50	96	123	156	194	-4008	482	4037	10
35.00	110	241	264	194	-3822	426	3845	13
33.00	119	330	351	194	-3672	383	3692	13
33.00	120	330	351	65	-1873	313	1899	22
30.00	130	394	415	65	-1648	248	1667	24
27.50	137	440	461	65	-1461	193	1474	26
25.00	142	481	502	65	-1274	138	1281	27
22.50	145	517	537	65	-1087	84	1090	28
20.00	147	547	566	65	-900	30	900	28
20.00	147	547	566	-65	900	-38	901	28
17.50	145	517	537	-65	1087	-92	1091	28
15.00	141	481	502	-65	1274	-146	1282	27
12.50	136	440	461	-65	1461	-201	1475	26
10.00	129	394	414	-65	1648	-256	1668	24
7.00	119	330	351	-65	1873	-321	1900	22
7.00	118	330	351	-195	3672	-391	3693	13
5.00	108	241	264	-195	3822	-434	3846	13
2.50	94	123	155	-195	4008	-490	4038	10
0.00	79	0	79	-195	4195	-547	4231	9

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	28	0	28	30	-3249	529	3292	-6
37.50	43	95	104	30	-3062	475	3099	-4
35.00	57	184	192	30	-2875	421	2906	-3
33.00	66	251	260	30	-2725	377	2751	-3
33.00	66	251	260	10	-1557	312	1588	2
30.00	77	303	312	10	-1333	247	1355	3
27.50	83	340	350	10	-1146	193	1162	4
25.00	88	372	382	10	-958	139	968	5
22.50	91	398	408	10	-771	85	776	6
20.00	93	418	428	10	-584	31	585	6
20.00	93	418	428	-10	584	-34	585	6
17.50	91	398	408	-10	771	-88	776	6
15.00	88	372	382	-10	958	-142	969	5
12.50	83	340	350	-10	1146	-196	1162	4
10.00	76	303	312	-10	1333	-250	1356	3
7.00	66	251	259	-10	1557	-315	1589	2
7.00	66	251	259	-30	2725	-381	2752	-3
5.00	56	184	192	-30	2875	-424	2906	-3
2.50	43	95	104	-30	3062	-478	3099	-4
0.00	28	0	28	-30	3249	-532	3293	-6

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	8.0	8.1	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	1.1	7.1	7.2	0.0	1.51	0.04	0.00	0.29	1.55	65.00	41.92
55.00	1.0	6.2	6.3	0.0	2.75	0.07	0.00	0.28	2.82	65.00	23.06
50.00	0.8	5.3	5.3	0.0	3.80	0.09	0.00	0.28	3.89	65.00	16.70
48.00	0.8	4.9	5.0	0.0	4.18	0.10	0.00	0.28	4.28	65.00	15.20
48.00	0.8	4.9	5.0	0.0	2.83	0.06	0.00	0.19	2.89	65.00	22.48
45.00	0.7	4.4	4.5	0.0	3.18	0.08	0.00	0.19	3.26	65.00	19.96
45.00	0.7	4.4	4.5	0.0	3.30	0.02	1.56	2.42	5.01	65.00	12.98
40.00	0.6	3.6	3.6	0.0	6.17	0.05	1.43	2.26	6.90	65.00	9.43
35.00	0.5	2.8	2.9	0.0	8.88	0.07	1.31	2.11	9.24	65.00	7.03
32.00	0.4	2.4	2.4	0.0	10.37	0.08	1.24	2.03	10.68	65.00	6.09
32.00	0.4	2.4	2.4	0.0	9.65	0.20	1.09	1.91	10.04	65.00	6.47
30.00	0.4	2.1	2.1	0.0	10.63	0.21	1.06	1.86	11.00	65.00	5.91
30.00	0.4	2.1	2.1	0.0	10.64	0.22	1.06	1.87	11.02	65.00	5.90
25.00	0.3	1.5	1.5	0.0	12.86	0.24	0.98	1.77	13.21	65.00	4.92
21.25	0.2	1.1	1.1	0.0	14.30	0.25	0.92	1.69	14.64	65.00	4.44
21.25	0.2	1.1	1.1	0.0	14.21	0.33	0.88	1.68	14.63	65.00	4.44
20.00	0.2	1.0	1.0	0.0	14.68	0.34	0.86	1.65	15.09	65.00	4.31
15.00	0.1	0.6	0.6	0.0	16.37	0.35	0.80	1.57	16.78	65.00	3.87
10.00	0.0	0.2	0.3	0.0	17.81	0.36	0.74	1.49	18.23	65.00	3.57
5.00	0.0	0.1	0.1	0.0	19.04	0.38	0.69	1.42	19.46	65.00	3.34
0.00	0.0	0.0	0.0	0.0	20.09	0.39	0.65	1.36	20.52	65.00	3.17

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	8.0	8.1	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	1.1	7.1	7.2	0.1	1.51	0.04	0.00	0.29	1.55	65.00	41.92
55.00	1.0	6.2	6.3	0.0	2.75	0.07	0.00	0.28	2.82	65.00	23.06
50.00	0.8	5.3	5.3	0.0	3.80	0.09	0.00	0.28	3.89	65.00	16.70
48.00	0.8	4.9	5.0	0.0	4.18	0.10	0.00	0.28	4.28	65.00	15.20
48.00	0.8	4.9	5.0	0.0	2.83	0.06	0.00	0.19	2.89	65.00	22.48
45.00	0.7	4.4	4.5	0.0	3.18	0.08	0.00	0.19	3.26	65.00	19.96
45.00	0.7	4.4	4.5	0.0	3.27	0.13	1.57	2.43	5.06	65.00	12.84
40.00	0.6	3.6	3.6	0.0	6.16	0.15	1.43	2.26	7.06	65.00	9.20
35.00	0.5	2.8	2.9	0.0	8.89	0.17	1.31	2.12	9.33	65.00	6.96
32.00	0.4	2.4	2.4	0.0	10.37	0.18	1.25	2.04	10.77	65.00	6.04
32.00	0.4	2.4	2.4	0.0	9.65	0.30	1.10	1.92	10.12	65.00	6.42
30.00	0.4	2.1	2.1	0.0	10.63	0.30	1.06	1.87	11.08	65.00	5.87
30.00	0.4	2.1	2.1	0.0	10.64	0.32	1.06	1.88	11.10	65.00	5.85
25.00	0.3	1.5	1.5	0.0	12.86	0.33	0.98	1.77	13.29	65.00	4.89
21.25	0.2	1.1	1.1	0.0	14.30	0.34	0.93	1.70	14.72	65.00	4.42
21.25	0.2	1.1	1.1	0.0	14.21	0.42	0.88	1.68	14.70	65.00	4.42
20.00	0.2	1.0	1.0	0.0	14.67	0.43	0.87	1.66	15.17	65.00	4.29
15.00	0.1	0.6	0.6	0.0	16.37	0.44	0.81	1.57	16.85	65.00	3.86
10.00	0.0	0.2	0.3	0.0	17.81	0.45	0.75	1.50	18.29	65.00	3.55
5.00	0.0	0.1	0.1	0.0	19.03	0.46	0.70	1.43	19.52	65.00	3.33
0.00	0.0	0.0	0.0	0.0	20.08	0.47	0.66	1.37	20.57	65.00	3.16

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	4.4	4.5	0.0	12.36	0.18	0.02	1.48	12.55	65.00	5.18
37.50	0.7	4.5	4.6	0.1	7.62	0.18	0.02	1.48	8.07	65.00	8.06
35.00	0.7	4.7	4.7	0.1	4.84	0.18	0.02	1.48	5.42	65.00	11.99
33.00	0.7	4.8	4.8	0.1	4.99	0.18	0.02	1.47	5.72	65.00	11.36
33.00	0.7	4.8	4.8	0.1	4.99	0.06	0.01	0.54	5.13	65.00	12.67
30.00	0.7	4.9	4.9	0.1	6.07	0.06	0.01	0.54	6.16	65.00	10.55
27.50	0.7	5.0	5.0	0.1	7.32	0.06	0.01	0.54	7.41	65.00	8.77
25.00	0.7	5.1	5.1	0.1	8.51	0.06	0.01	0.55	8.60	65.00	7.55
22.50	0.7	5.1	5.2	0.1	9.65	0.06	0.01	0.56	9.74	65.00	6.67
20.00	0.7	5.1	5.2	0.0	10.93	0.06	0.01	0.57	10.99	65.00	5.92
20.00	0.7	5.1	5.2	0.0	10.93	0.05	0.00	0.49	10.99	65.00	5.91
17.50	0.7	5.1	5.2	0.0	9.69	0.05	0.00	0.51	9.77	65.00	6.65
15.00	0.7	5.1	5.1	0.0	8.47	0.05	0.00	0.53	8.55	65.00	7.60
12.50	0.7	5.0	5.0	0.0	7.26	0.05	0.00	0.54	7.35	65.00	8.84
10.00	0.7	4.9	4.9	-0.1	6.06	0.05	0.00	0.56	6.16	65.00	10.55
7.00	0.7	4.8	4.8	-0.1	5.36	0.05	0.00	0.59	5.51	65.00	11.81
7.00	0.7	4.8	4.8	-0.1	5.36	0.17	0.01	1.44	6.02	65.00	10.81
5.00	0.7	4.7	4.7	0.0	4.89	0.17	0.01	1.45	5.50	65.00	11.83
2.50	0.7	4.5	4.6	0.0	7.41	0.17	0.01	1.46	7.86	65.00	8.27
0.00	0.7	4.4	4.5	0.0	12.26	0.17	0.01	1.47	12.44	65.00	5.22

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESG Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	2.4	2.4	0.0	1.19	0.00	1.49	2.08	3.79	65.00	17.16
37.50	0.4	2.4	2.5	0.2	2.39	0.00	1.49	2.05	4.05	65.00	16.04
35.00	0.4	2.5	2.5	0.3	4.20	0.00	1.49	2.02	5.07	65.00	12.82
33.00	0.4	2.5	2.5	0.4	5.58	0.00	1.49	2.00	6.26	65.00	10.38
33.00	0.4	2.5	2.5	0.4	5.59	0.00	0.49	0.76	5.67	65.00	11.47
30.00	0.4	2.5	2.6	0.5	6.58	0.00	0.49	0.73	6.65	65.00	9.78
27.50	0.4	2.6	2.6	0.6	7.30	0.00	0.49	0.70	7.37	65.00	8.82
25.00	0.4	2.6	2.6	0.7	7.94	0.00	0.49	0.67	8.00	65.00	8.13
22.50	0.4	2.6	2.6	0.7	8.48	0.00	0.49	0.65	8.53	65.00	7.62
20.00	0.4	2.6	2.6	0.7	8.93	0.00	0.49	0.62	8.98	65.00	7.24
20.00	0.4	2.6	2.6	0.7	8.93	0.00	0.50	0.62	8.98	65.00	7.24
17.50	0.4	2.6	2.6	0.7	8.48	0.00	0.50	0.65	8.53	65.00	7.62
15.00	0.4	2.6	2.6	0.7	7.93	0.00	0.50	0.68	7.99	65.00	8.13
12.50	0.4	2.6	2.6	0.6	7.30	0.00	0.50	0.70	7.36	65.00	8.83
10.00	0.4	2.5	2.6	0.5	6.57	0.00	0.50	0.73	6.64	65.00	9.78
7.00	0.4	2.5	2.5	0.4	5.58	0.00	0.50	0.76	5.66	65.00	11.48
7.00	0.4	2.5	2.5	0.4	5.58	0.00	1.49	2.00	6.26	65.00	10.39
5.00	0.4	2.5	2.5	0.3	4.19	0.00	1.49	2.03	5.07	65.00	12.83
2.50	0.4	2.4	2.5	0.2	2.38	0.00	1.49	2.05	4.04	65.00	16.08
0.00	0.4	2.4	2.4	0.0	1.16	0.00	1.49	2.08	3.78	65.00	17.17

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.1	1.1	0.0	0.42	0.00	0.23	0.69	1.26	65.00	51.60
37.50	0.2	1.1	1.1	0.1	1.66	0.00	0.23	0.66	1.75	65.00	37.12
35.00	0.2	1.1	1.2	0.2	3.05	0.00	0.23	0.63	3.10	65.00	20.98
33.00	0.2	1.2	1.2	0.3	4.09	0.00	0.23	0.61	4.13	65.00	15.73
33.00	0.2	1.2	1.2	0.3	4.09	0.00	0.08	0.30	4.10	65.00	15.86
30.00	0.2	1.2	1.2	0.4	4.92	0.00	0.08	0.26	4.92	65.00	13.20
27.50	0.2	1.2	1.2	0.5	5.51	0.00	0.08	0.24	5.51	65.00	11.80
25.00	0.2	1.2	1.2	0.5	6.00	0.00	0.08	0.21	6.00	65.00	10.83
22.50	0.2	1.2	1.2	0.5	6.40	0.00	0.08	0.18	6.40	65.00	10.15
20.00	0.2	1.2	1.2	0.6	6.71	0.00	0.08	0.16	6.71	65.00	9.68
17.50	0.2	1.2	1.2	0.5	6.40	0.00	0.08	0.18	6.40	65.00	10.15
15.00	0.2	1.2	1.2	0.5	6.00	0.00	0.08	0.21	6.00	65.00	10.83
12.50	0.2	1.2	1.2	0.5	5.50	0.00	0.08	0.24	5.51	65.00	11.80
10.00	0.2	1.2	1.2	0.4	4.92	0.00	0.08	0.27	4.92	65.00	13.21
7.00	0.2	1.2	1.2	0.3	4.09	0.00	0.08	0.30	4.10	65.00	15.87
7.00	0.2	1.2	1.2	0.3	4.09	0.00	0.23	0.61	4.13	65.00	15.75
5.00	0.2	1.1	1.2	0.2	3.04	0.00	0.23	0.63	3.10	65.00	21.00
2.50	0.2	1.1	1.1	0.1	1.65	0.00	0.23	0.66	1.75	65.00	37.19
0.00	0.2	1.1	1.1	0.0	0.40	0.00	0.23	0.69	1.26	65.00	51.67

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	589	1408	1526	717
60.00	85	-52	99	0	971	1411	1713	1054
55.00	169	-122	209	0	1374	1414	1972	1410
50.00	254	-217	334	0	1797	1418	2289	1784
48.00	288	-262	390	0	1972	1419	2430	1938
48.00	288	-262	390	0	1972	1419	2430	1939
45.00	340	-338	479	0	2242	1423	2655	2293
45.00	344	169	383	833	2324	14121	14311	3865
40.00	1191	16	1191	833	2790	14127	14400	4478
35.00	2039	-165	2046	833	3260	14130	14501	5140
32.00	2548	-288	2564	833	3563	14134	14576	5538
32.00	2456	-288	2472	693	8075	13942	16111	7949
30.00	2790	-484	2832	693	8281	13944	16218	8219
30.00	2790	-496	2834	694	9083	13939	16638	8451
25.00	3627	-1057	3778	694	9603	13936	16925	9170
21.25	4254	-1498	4510	694	10013	13941	17164	9710
21.25	4239	-1498	4496	617	10259	13912	17285	12019
20.00	4448	-1653	4745	618	10390	13902	17356	12222
15.00	5282	-2293	5758	618	10945	13886	17681	13008
10.00	6116	-2967	6797	618	11518	13866	18026	13824
5.00	6948	-3676	7860	618	12110	13843	18392	14670
0.00	7778	-4421	8947	618	12739	13844	18813	15506

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	578	1412	1526	718
60.00	85	-51	99	0	960	1418	1713	1054
55.00	170	-121	209	0	1363	1424	1971	1410
50.00	256	-215	334	0	1786	1431	2288	1784
48.00	290	-260	390	0	1961	1433	2429	1938
48.00	290	-260	390	0	1961	1433	2429	1939
45.00	342	-336	479	0	2230	1439	2654	2293
45.00	338	1082	1134	-823	9056	14109	16765	11894
40.00	1185	525	1296	-823	9535	14103	17024	12514
35.00	2031	-62	2032	-823	10029	14097	17301	13166
32.00	2539	-429	2575	-823	10332	14102	17482	13563
32.00	2441	-429	2479	-685	7101	14319	15983	16008
30.00	2785	-602	2849	-685	7307	14322	16078	16278
30.00	2785	-614	2852	-684	8115	14307	16448	16511
25.00	3644	-1117	3811	-684	8641	14289	16699	17230
21.25	4287	-1515	4547	-684	9051	14294	16919	17770
21.25	4266	-1516	4528	-608	10066	14335	17516	19997
20.00	4481	-1668	4782	-608	10199	14313	17575	20201
15.00	5340	-2297	5813	-608	10756	14277	17875	20987
10.00	6197	-2960	6868	-608	11329	14237	18194	21804
5.00	7051	-3659	7944	-608	11918	14193	18533	22652
0.00	7903	-4393	9041	-608	12547	14194	18944	23487

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-833	507	975	-4	-1568	12698	12795	-93
37.50	-452	552	714	-4	-1431	12697	12778	-93
35.00	-71	593	597	-4	-1294	12697	12762	-102
33.00	234	623	665	-4	-1184	12696	12751	-101
33.00	234	626	668	-4	1811	4267	4635	2234
30.00	387	558	679	-4	1978	4264	4700	2235
27.50	515	497	716	-4	2117	4261	4758	2237
25.00	643	431	774	-4	2257	4258	4819	2240
22.50	771	361	851	-4	2396	4253	4882	2244
20.00	898	287	943	-4	2534	4252	4949	2244
20.00	898	291	944	-4	5538	-4194	6947	4522
17.50	772	122	782	-4	5676	-4196	7058	4522
15.00	646	-50	648	-4	5815	-4204	7175	4515
12.50	520	-226	567	-4	5953	-4211	7292	4510
10.00	394	-407	566	-4	6085	-4221	7406	4510
7.00	242	-629	674	-4	6251	-4225	7545	4510
7.00	242	-626	671	-4	9244	-12679	15691	6758
5.00	-63	-849	851	-4	9345	-12680	15752	6772
2.50	-443	-1131	1215	-4	9469	-12678	15824	6800
0.00	-824	-1418	1639	-4	9606	-12680	15908	6800

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	140	0	140	92	-2410	-189	2417	-4512
37.50	134	70	151	92	-2273	-190	2281	-4512
35.00	129	136	187	92	-2137	-190	2145	-4511
33.00	124	186	224	92	-2027	-191	2036	-4511
33.00	157	186	243	28	-1150	-199	1167	-4087
30.00	149	224	270	28	-985	-200	1005	-4087
27.50	143	252	290	28	-849	-200	873	-4087
25.00	137	275	308	28	-714	-201	742	-4086
22.50	131	295	323	28	-578	-201	612	-4086
20.00	125	310	335	28	-443	-202	487	-4085
20.00	158	310	348	-35	435	-210	483	-3665
17.50	151	295	331	-35	571	-210	608	-3665
15.00	145	276	311	-35	707	-211	738	-3665
12.50	139	252	288	-35	843	-212	869	-3666
10.00	132	225	261	-35	980	-212	1002	-3667
7.00	125	187	224	-35	1145	-214	1165	-3667
7.00	157	186	244	-98	2025	-224	2037	-3249
5.00	152	136	204	-98	2135	-225	2147	-3249
2.50	145	70	161	-98	2273	-226	2284	-3250
0.00	138	0	138	-98	2411	-228	2422	-3250

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	76	0	76	15	-2295	-22	2295	-248
37.50	75	67	101	15	-2158	-23	2158	-247
35.00	75	129	149	15	-2021	-24	2021	-247
33.00	74	177	192	15	-1911	-24	1911	-246
33.00	81	170	188	3	-1142	-30	1142	173
30.00	79	208	223	3	-977	-31	978	174
27.50	78	236	248	3	-840	-32	841	174
25.00	78	259	270	3	-703	-33	703	175
22.50	77	278	288	3	-565	-34	566	175
20.00	75	293	302	3	-427	-35	429	175
20.00	82	286	298	-9	343	-41	345	592
17.50	81	274	285	-9	480	-42	482	592
15.00	79	257	269	-9	618	-44	620	592
12.50	78	237	249	-9	756	-45	758	591
10.00	77	212	225	-9	895	-46	896	591
7.00	75	177	192	-9	1060	-48	1062	590
7.00	81	170	189	-21	1832	-54	1832	1005
5.00	80	125	148	-21	1942	-55	1943	1005
2.50	78	64	101	-21	2080	-57	2081	1004
0.00	77	0	77	-21	2219	-58	2219	1004

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	3.0	7.5	8.1	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	2.7	6.7	7.2	0.0	0.93	0.06	0.00	0.19	0.99	65.00	65.91
55.00	2.4	5.8	6.3	0.0	1.79	0.07	0.00	0.21	1.86	65.00	34.97
50.00	2.1	5.0	5.4	0.0	2.62	0.09	0.00	0.23	2.70	65.00	24.04
48.00	2.0	4.7	5.1	0.0	2.94	0.09	0.00	0.23	3.03	65.00	21.42
48.00	2.0	4.7	5.1	0.0	1.99	0.06	0.00	0.16	2.05	65.00	31.68
45.00	1.8	4.2	4.6	0.0	2.31	0.07	0.00	0.17	2.39	65.00	27.25
45.00	1.8	4.2	4.6	0.0	1.81	0.12	1.96	2.86	5.07	65.00	12.81
40.00	1.5	3.4	3.7	0.0	5.09	0.13	1.79	2.66	6.22	65.00	10.45
35.00	1.2	2.7	3.0	0.0	8.12	0.15	1.64	2.48	8.76	65.00	7.42
32.00	1.1	2.3	2.5	0.0	9.73	0.15	1.56	2.38	10.25	65.00	6.34
32.00	1.1	2.3	2.5	0.0	9.39	0.22	1.30	2.21	9.79	65.00	6.64
30.00	1.0	2.0	2.2	0.0	10.47	0.23	1.26	2.16	10.84	65.00	6.00
30.00	1.0	2.0	2.2	0.0	10.48	0.23	1.26	2.18	10.85	65.00	5.99
25.00	0.7	1.4	1.6	0.0	12.94	0.24	1.16	2.06	13.27	65.00	4.90
21.25	0.5	1.0	1.2	0.0	14.54	0.25	1.10	1.98	14.85	65.00	4.38
21.25	0.5	1.0	1.2	0.0	14.49	0.31	0.98	1.87	14.84	65.00	4.38
20.00	0.5	0.9	1.0	0.0	14.99	0.31	0.96	1.84	15.33	65.00	4.24
15.00	0.3	0.5	0.6	0.0	16.77	0.32	0.89	1.76	17.12	65.00	3.80
10.00	0.1	0.2	0.3	0.0	18.30	0.33	0.83	1.68	18.64	65.00	3.49
5.00	0.0	0.1	0.1	0.0	19.60	0.33	0.77	1.62	19.95	65.00	3.26
0.00	0.0	0.0	0.0	0.0	20.72	0.34	0.72	1.56	21.07	65.00	3.09

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.9	7.6	8.1	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	2.6	6.7	7.2	0.1	0.93	0.06	0.00	0.19	0.98	65.00	66.02
55.00	2.3	5.9	6.3	0.0	1.78	0.07	0.00	0.21	1.86	65.00	35.02
50.00	2.0	5.1	5.5	0.0	2.61	0.09	0.00	0.23	2.70	65.00	24.06
48.00	1.9	4.7	5.1	0.0	2.94	0.09	0.00	0.23	3.03	65.00	21.43
48.00	1.9	4.7	5.1	0.0	1.99	0.06	0.00	0.16	2.05	65.00	31.70
45.00	1.8	4.3	4.6	0.0	2.31	0.07	0.00	0.17	2.38	65.00	27.26
45.00	1.8	4.3	4.6	0.0	5.47	0.37	1.94	3.00	7.75	65.00	8.38
40.00	1.5	3.5	3.8	0.0	5.64	0.37	1.77	2.80	7.49	65.00	8.68
35.00	1.2	2.7	3.0	0.0	7.99	0.38	1.62	2.62	9.22	65.00	7.05
32.00	1.1	2.3	2.5	0.0	9.84	0.38	1.54	2.52	10.73	65.00	6.06
32.00	1.1	2.3	2.5	0.0	9.48	0.45	1.28	2.18	10.24	65.00	6.35
30.00	1.0	2.0	2.3	0.0	10.57	0.45	1.24	2.13	11.29	65.00	5.76
30.00	1.0	2.0	2.3	0.0	10.58	0.45	1.24	2.15	11.32	65.00	5.74
25.00	0.7	1.4	1.6	0.0	13.05	0.45	1.15	2.04	13.72	65.00	4.74
21.25	0.5	1.0	1.2	0.0	14.66	0.45	1.08	1.96	15.29	65.00	4.25
21.25	0.5	1.0	1.2	0.0	14.59	0.51	0.96	1.86	15.26	65.00	4.26
20.00	0.5	0.9	1.0	0.0	15.10	0.51	0.94	1.84	15.76	65.00	4.12
15.00	0.3	0.5	0.6	0.0	16.94	0.51	0.88	1.75	17.58	65.00	3.70
10.00	0.1	0.2	0.3	0.0	18.51	0.51	0.82	1.68	19.13	65.00	3.40
5.00	0.0	0.1	0.1	0.0	19.85	0.52	0.76	1.61	20.46	65.00	3.18
0.00	0.0	0.0	0.0	0.0	20.99	0.52	0.71	1.55	21.59	65.00	3.01

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.8	4.2	4.6	0.0	15.33	0.01	0.03	1.81	15.41	65.00	4.22
37.50	1.8	4.3	4.7	0.2	10.87	0.01	0.03	1.81	11.28	65.00	5.76
35.00	1.8	4.5	4.8	0.3	9.15	0.01	0.03	1.81	9.63	65.00	6.75
33.00	1.8	4.6	4.9	0.3	10.58	0.01	0.03	1.80	10.93	65.00	5.95
33.00	1.8	4.6	4.9	0.3	10.63	0.15	0.03	0.68	10.84	65.00	5.99
30.00	1.8	4.8	5.1	0.4	10.56	0.15	0.03	0.69	10.78	65.00	6.03
27.50	1.8	4.9	5.2	0.4	10.60	0.15	0.03	0.69	10.79	65.00	6.03
25.00	1.8	5.0	5.3	0.4	12.08	0.15	0.03	0.70	12.27	65.00	5.30
22.50	1.8	5.1	5.4	0.3	13.53	0.15	0.03	0.71	13.72	65.00	4.74
20.00	1.8	5.1	5.4	0.3	14.95	0.15	0.03	0.72	15.14	65.00	4.29
20.00	1.8	5.1	5.4	0.3	14.97	0.31	0.03	1.00	15.31	65.00	4.25
17.50	1.8	5.1	5.4	0.2	12.10	0.31	0.03	1.02	12.44	65.00	5.22
15.00	1.8	5.0	5.3	0.1	9.81	0.31	0.03	1.03	10.26	65.00	6.33
12.50	1.8	4.9	5.2	0.0	9.02	0.31	0.03	1.05	9.50	65.00	6.84
10.00	1.8	4.8	5.1	0.0	8.38	0.31	0.03	1.06	8.83	65.00	7.36
7.00	1.8	4.6	5.0	-0.1	10.72	0.31	0.03	1.08	11.14	65.00	5.84
7.00	1.8	4.6	5.0	-0.1	10.67	0.46	0.03	2.22	11.74	65.00	5.54
5.00	1.8	4.5	4.9	-0.1	12.86	0.46	0.03	2.23	13.47	65.00	4.82
2.50	1.8	4.4	4.7	-0.1	19.33	0.46	0.03	2.24	19.89	65.00	3.27
0.00	1.8	4.3	4.6	0.0	25.85	0.46	0.03	2.25	26.39	65.00	2.46

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.1	2.3	2.5	0.0	2.06	0.31	0.70	1.04	2.51	65.00	25.90
37.50	1.1	2.3	2.6	0.1	2.40	0.31	0.70	1.02	2.79	65.00	23.26
35.00	1.1	2.4	2.6	0.2	2.79	0.31	0.70	1.00	3.24	65.00	20.03
33.00	1.1	2.4	2.6	0.2	3.49	0.31	0.70	0.99	3.93	65.00	16.55
33.00	1.1	2.4	2.6	0.2	3.69	0.28	0.22	0.38	3.97	65.00	16.37
30.00	1.1	2.4	2.7	0.3	4.21	0.28	0.22	0.36	4.49	65.00	14.47
27.50	1.1	2.5	2.7	0.4	4.58	0.28	0.22	0.34	4.86	65.00	13.37
25.00	1.1	2.5	2.7	0.4	4.88	0.28	0.22	0.32	5.17	65.00	12.57
22.50	1.1	2.5	2.7	0.4	5.13	0.28	0.22	0.30	5.42	65.00	12.00
20.00	1.1	2.5	2.7	0.4	5.32	0.28	0.22	0.29	5.61	65.00	11.59
20.00	1.1	2.5	2.7	0.4	5.51	0.25	0.27	0.33	5.78	65.00	11.24
17.50	1.1	2.5	2.7	0.4	5.25	0.25	0.27	0.35	5.52	65.00	11.77
15.00	1.1	2.5	2.7	0.4	4.93	0.25	0.27	0.37	5.20	65.00	12.50
12.50	1.1	2.5	2.7	0.4	4.55	0.25	0.27	0.39	4.82	65.00	13.48
10.00	1.1	2.5	2.7	0.3	4.11	0.25	0.27	0.41	4.38	65.00	14.84
7.00	1.1	2.4	2.7	0.2	3.50	0.25	0.27	0.43	3.77	65.00	17.22
7.00	1.1	2.4	2.7	0.2	3.70	0.22	0.75	1.04	4.09	65.00	15.90
5.00	1.1	2.4	2.6	0.2	3.06	0.22	0.75	1.05	3.39	65.00	19.18
2.50	1.1	2.3	2.6	0.1	2.56	0.22	0.75	1.07	2.94	65.00	22.07
0.00	1.1	2.3	2.5	0.0	2.03	0.22	0.75	1.09	2.62	65.00	24.85

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	1.0	1.2	0.0	1.12	0.02	0.12	0.44	1.33	65.00	48.70
37.50	0.5	1.1	1.2	0.1	1.51	0.02	0.12	0.42	1.65	65.00	39.49
35.00	0.5	1.1	1.2	0.2	2.36	0.02	0.12	0.40	2.37	65.00	27.37
33.00	0.5	1.1	1.2	0.2	3.05	0.02	0.12	0.38	3.06	65.00	21.21
33.00	0.5	1.1	1.2	0.2	2.99	0.01	0.02	0.18	3.01	65.00	21.62
30.00	0.5	1.1	1.2	0.3	3.55	0.01	0.02	0.16	3.56	65.00	18.26
27.50	0.5	1.1	1.3	0.3	3.94	0.01	0.02	0.14	3.95	65.00	16.44
25.00	0.5	1.2	1.3	0.4	4.27	0.01	0.02	0.12	4.29	65.00	15.16
22.50	0.5	1.2	1.3	0.4	4.55	0.01	0.02	0.10	4.56	65.00	14.25
20.00	0.5	1.2	1.3	0.4	4.76	0.01	0.02	0.08	4.77	65.00	13.62
20.00	0.5	1.2	1.3	0.4	4.70	0.04	0.07	0.12	4.75	65.00	13.70
17.50	0.5	1.2	1.3	0.4	4.51	0.04	0.07	0.13	4.56	65.00	14.26
15.00	0.5	1.2	1.3	0.4	4.26	0.04	0.07	0.15	4.31	65.00	15.09
12.50	0.5	1.2	1.3	0.3	3.95	0.04	0.07	0.17	4.00	65.00	16.26
10.00	0.5	1.1	1.3	0.3	3.58	0.04	0.07	0.19	3.63	65.00	17.93
7.00	0.5	1.1	1.2	0.2	3.05	0.04	0.07	0.22	3.10	65.00	20.97
7.00	0.5	1.1	1.2	0.2	3.00	0.07	0.16	0.42	3.09	65.00	21.00
5.00	0.5	1.1	1.2	0.2	2.32	0.07	0.16	0.43	2.43	65.00	26.74
2.50	0.5	1.1	1.2	0.1	1.54	0.07	0.16	0.45	1.77	65.00	36.68
0.00	0.5	1.0	1.2	0.0	1.13	0.07	0.16	0.47	1.45	65.00	44.98

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	509	1493	1577	708
60.00	106	-31	110	0	511	1880	1948	1044
55.00	231	-61	239	0	514	2288	2345	1400
50.00	381	-92	392	0	516	2717	2766	1774
48.00	449	-105	461	0	518	2895	2941	1929
48.00	449	-105	461	0	518	2894	2940	1930
45.00	558	-123	571	0	520	3169	3212	2284
45.00	564	-118	576	907	548	17702	17710	5893
40.00	1640	-151	1647	907	537	18171	18179	6524
35.00	2745	-183	2751	907	530	18658	18666	7186
32.00	3422	-202	3428	907	532	18966	18973	7583
32.00	3328	-202	3334	869	4312	20948	21387	9980
30.00	3833	-305	3845	869	4314	21157	21592	10250
30.00	3845	-305	3857	869	4307	21955	22373	10488
25.00	5178	-563	5209	869	4297	22471	22878	11228
21.25	6199	-756	6245	869	4299	22886	23286	11768
21.25	6172	-756	6218	916	3925	24906	25214	14028
20.00	6546	-815	6597	916	3916	25025	25329	14253
15.00	8065	-1049	8133	916	3902	25559	25855	15077
10.00	9617	-1282	9702	916	3887	26107	26395	15936
5.00	11201	-1515	11303	916	3872	26668	26948	16828
0.00	12820	-1747	12939	916	3873	27298	27572	17663

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	495	1498	1577	708
60.00	106	-30	110	0	494	1885	1948	1045
55.00	232	-59	239	0	492	2293	2345	1400
50.00	382	-89	392	0	491	2722	2765	1775
48.00	450	-100	461	0	490	2899	2940	1929
48.00	450	-100	461	0	490	2899	2940	1930
45.00	559	-118	571	0	490	3174	3211	2284
45.00	563	778	960	-912	7084	17734	19097	9632
40.00	1641	353	1679	-912	7099	18193	19530	10262
35.00	2748	-74	2749	-912	7109	18673	19981	10924
32.00	3425	-329	3441	-912	7109	18980	20268	11321
32.00	3330	-330	3346	-877	3337	20970	21233	13734
30.00	3836	-410	3858	-877	3337	21178	21440	14005
30.00	3848	-410	3870	-877	3341	21968	22221	14242
25.00	5182	-611	5218	-877	3348	22474	22722	14982
21.25	6203	-762	6249	-877	3348	22889	23133	15522
21.25	6175	-762	6222	-924	3725	24909	25186	17781
20.00	6549	-818	6600	-924	3728	25019	25295	18006
15.00	8068	-1043	8135	-924	3732	25540	25811	18830
10.00	9618	-1267	9701	-924	3735	26074	26340	19688
5.00	11201	-1492	11300	-924	3735	26621	26882	20580
0.00	12817	-1717	12931	-924	3735	27251	27506	21415

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-907	5	907	-6	-3602	14535	14974	-44
37.50	-475	111	487	-6	-3468	14320	14734	-44
35.00	-48	213	219	-6	-3335	14105	14494	-55
33.00	288	292	410	-6	-3228	13934	14303	-55
33.00	288	292	410	-3	-290	5400	5408	2205
30.00	478	300	564	-3	-129	5141	5143	2209
27.50	629	302	698	-3	5	4924	4924	2215
25.00	774	299	829	-3	140	4706	4708	2221
22.50	912	293	958	-3	274	4488	4497	2228
20.00	1043	283	1081	-3	408	4274	4293	2227
20.00	1043	283	1081	1	3352	-4278	5434	4424
17.50	911	180	929	1	3485	-4492	5686	4424
15.00	773	74	777	1	3620	-4714	5943	4415
12.50	628	-37	629	1	3754	-4934	6200	4409
10.00	477	-151	500	1	3887	-5154	6455	4403
7.00	287	-294	411	1	4046	-5415	6759	4400
7.00	287	-294	411	4	6986	-13976	15625	6545
5.00	-51	-463	466	4	7088	-14147	15823	6552
2.50	-478	-678	830	4	7214	-14356	16066	6572
0.00	-912	-896	1279	4	7347	-14571	16318	6572

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	38	0	38	95	-2378	1989	3100	-3788
37.50	94	69	117	95	-2244	1775	2861	-3788
35.00	144	135	197	95	-2111	1561	2626	-3786
33.00	180	184	257	95	-2004	1390	2439	-3786
33.00	180	184	257	31	-1128	1197	1645	-3783
30.00	218	222	311	31	-969	941	1351	-3782
27.50	243	249	348	31	-836	729	1109	-3781
25.00	262	272	378	31	-704	516	873	-3780
22.50	274	291	400	31	-572	304	647	-3780
20.00	280	306	415	31	-438	90	447	-3780
20.00	280	306	415	-32	438	-102	449	-3780
17.50	274	291	400	-32	572	-316	653	-3780
15.00	261	272	377	-32	704	-529	880	-3780
12.50	242	249	347	-32	836	-741	1118	-3781
10.00	217	222	310	-32	969	-954	1360	-3782
7.00	178	184	256	-32	1128	-1209	1654	-3783
7.00	178	184	256	-95	2004	-1402	2446	-3786
5.00	142	135	196	-95	2111	-1574	2633	-3786
2.50	92	69	115	-95	2243	-1787	2868	-3788
0.00	35	0	35	-95	2378	-2001	3108	-3788

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-46	0	46	27	-2232	2034	3020	365
37.50	12	65	66	27	-2097	1820	2777	365
35.00	63	126	141	27	-1962	1607	2536	366
33.00	100	172	198	27	-1854	1436	2345	366
33.00	100	172	198	9	-1086	1218	1632	369
30.00	139	208	250	9	-924	961	1333	370
27.50	164	233	286	9	-789	747	1087	371
25.00	184	255	314	9	-654	534	844	371
22.50	196	273	336	9	-519	320	610	372
20.00	203	286	351	9	-384	106	398	372
20.00	203	286	351	-9	384	-112	400	372
17.50	196	273	336	-9	519	-325	612	372
15.00	183	255	314	-9	654	-539	848	371
12.50	164	233	285	-9	789	-753	1091	371
10.00	138	208	249	-9	924	-967	1337	370
7.00	99	172	198	-9	1086	-1223	1636	369
7.00	99	172	198	-28	1854	-1441	2348	366
5.00	62	126	140	-28	1962	-1612	2539	366
2.50	10	65	66	-28	2097	-1826	2780	365
0.00	-48	0	48	-28	2232	-2039	3023	365

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.4	11.4	11.5	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.2	10.1	10.2	0.1	1.06	0.06	0.00	0.21	1.12	65.00	58.09
55.00	1.1	8.9	9.0	0.1	2.07	0.07	0.00	0.24	2.15	65.00	30.30
50.00	0.9	7.7	7.7	0.1	3.08	0.09	0.00	0.27	3.16	65.00	20.54
48.00	0.9	7.2	7.2	0.1	3.48	0.09	0.00	0.28	3.57	65.00	18.21
48.00	0.9	7.2	7.2	0.1	2.35	0.06	0.00	0.19	2.41	65.00	26.93
45.00	0.8	6.5	6.5	0.1	2.75	0.07	0.00	0.20	2.83	65.00	23.01
45.00	0.8	6.5	6.5	0.1	2.77	0.18	2.14	3.25	5.74	65.00	11.33
40.00	0.7	5.3	5.3	0.0	7.15	0.19	1.95	3.05	8.28	65.00	7.85
35.00	0.5	4.2	4.2	0.0	10.90	0.21	1.79	2.87	11.65	65.00	5.58
32.00	0.5	3.6	3.6	0.0	12.89	0.21	1.70	2.77	13.53	65.00	4.81
32.00	0.5	3.6	3.6	0.0	12.54	0.28	1.63	2.83	13.15	65.00	4.94
30.00	0.4	3.2	3.2	0.0	14.04	0.28	1.58	2.77	14.60	65.00	4.45
30.00	0.4	3.2	3.2	0.0	14.08	0.29	1.58	2.81	14.66	65.00	4.43
25.00	0.3	2.2	2.3	0.0	17.64	0.30	1.46	2.67	18.13	65.00	3.58
21.25	0.2	1.7	1.7	0.0	19.99	0.30	1.37	2.58	20.45	65.00	3.18
21.25	0.2	1.7	1.7	0.0	19.91	0.36	1.45	2.75	20.45	65.00	3.18
20.00	0.2	1.5	1.5	0.0	20.73	0.36	1.42	2.71	21.26	65.00	3.06
15.00	0.1	0.8	0.9	0.0	23.74	0.37	1.32	2.59	24.24	65.00	2.68
10.00	0.1	0.4	0.4	0.0	26.38	0.38	1.23	2.48	26.86	65.00	2.42
5.00	0.0	0.1	0.1	0.0	28.68	0.38	1.15	2.38	29.15	65.00	2.23
0.00	0.0	0.0	0.0	0.0	30.71	0.39	1.07	2.29	31.18	65.00	2.08

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	11.4	11.5	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.1	10.2	10.2	0.1	1.06	0.06	0.00	0.21	1.12	65.00	58.09
55.00	1.0	8.9	9.0	0.1	2.07	0.07	0.00	0.24	2.14	65.00	30.31
50.00	0.9	7.7	7.7	0.1	3.08	0.09	0.00	0.27	3.16	65.00	20.55
48.00	0.9	7.2	7.2	0.1	3.48	0.09	0.00	0.28	3.57	65.00	18.22
48.00	0.9	7.2	7.2	0.1	2.35	0.06	0.00	0.19	2.41	65.00	26.94
45.00	0.8	6.5	6.5	0.1	2.75	0.07	0.00	0.20	2.82	65.00	23.02
45.00	0.8	6.5	6.5	0.1	4.58	0.30	2.15	3.34	7.49	65.00	8.68
40.00	0.7	5.3	5.3	0.0	7.39	0.31	1.96	3.13	8.96	65.00	7.25
35.00	0.5	4.2	4.2	0.0	10.79	0.31	1.80	2.95	11.76	65.00	5.53
32.00	0.5	3.6	3.6	0.0	13.02	0.32	1.71	2.85	13.71	65.00	4.74
32.00	0.5	3.6	3.6	0.0	12.67	0.38	1.64	2.83	13.32	65.00	4.88
30.00	0.4	3.2	3.2	0.0	14.15	0.38	1.59	2.77	14.76	65.00	4.41
30.00	0.4	3.2	3.2	0.0	14.20	0.39	1.59	2.82	14.80	65.00	4.39
25.00	0.3	2.2	2.3	0.0	17.69	0.39	1.47	2.67	18.24	65.00	3.56
21.25	0.2	1.7	1.7	0.0	20.01	0.40	1.39	2.58	20.52	65.00	3.17
21.25	0.2	1.7	1.7	0.0	19.92	0.46	1.46	2.76	20.50	65.00	3.17
20.00	0.2	1.5	1.5	0.0	20.74	0.46	1.43	2.72	21.31	65.00	3.05
15.00	0.1	0.8	0.9	0.0	23.75	0.46	1.33	2.60	24.29	65.00	2.68
10.00	0.1	0.4	0.4	0.0	26.37	0.46	1.24	2.49	26.90	65.00	2.42
5.00	0.0	0.1	0.1	0.0	28.67	0.47	1.16	2.39	29.19	65.00	2.23
0.00	0.0	0.0	0.0	0.0	30.69	0.47	1.08	2.30	31.20	65.00	2.08

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.8	6.5	6.5	0.1	13.37	0.00	0.04	2.13	13.55	65.00	4.80
37.50	0.8	6.6	6.7	0.1	7.65	0.00	0.04	2.10	7.95	65.00	8.17
35.00	0.8	6.8	6.8	0.2	3.43	0.00	0.04	2.07	4.92	65.00	13.22
33.00	0.8	6.9	7.0	0.2	6.05	0.00	0.04	2.04	6.70	65.00	9.70
33.00	0.8	6.9	7.0	0.2	6.05	0.15	0.02	0.77	6.32	65.00	10.29
30.00	0.8	7.1	7.2	0.3	8.85	0.15	0.02	0.74	9.01	65.00	7.21
27.50	0.8	7.3	7.3	0.3	11.08	0.15	0.02	0.71	11.24	65.00	5.78
25.00	0.8	7.4	7.4	0.3	13.19	0.15	0.02	0.68	13.35	65.00	4.87
22.50	0.8	7.5	7.5	0.3	15.18	0.15	0.02	0.65	15.34	65.00	4.24
20.00	0.8	7.5	7.5	0.3	17.05	0.15	0.02	0.62	17.21	65.00	3.78
20.00	0.8	7.5	7.5	0.3	17.05	0.30	0.01	0.76	17.36	65.00	3.74
17.50	0.8	7.5	7.5	0.3	14.50	0.30	0.01	0.80	14.80	65.00	4.39
15.00	0.8	7.4	7.4	0.2	11.82	0.30	0.01	0.83	12.12	65.00	5.36
12.50	0.8	7.3	7.3	0.2	9.46	0.30	0.01	0.87	9.85	65.00	6.60
10.00	0.8	7.1	7.2	0.1	7.93	0.30	0.01	0.90	8.34	65.00	7.79
7.00	0.8	6.9	7.0	0.1	6.07	0.30	0.01	0.95	6.56	65.00	9.91
7.00	0.8	6.9	7.0	0.1	6.07	0.45	0.03	2.20	7.50	65.00	8.67
5.00	0.8	6.8	6.8	0.0	7.12	0.45	0.03	2.23	8.00	65.00	8.13
2.50	0.8	6.6	6.7	0.0	12.88	0.45	0.03	2.26	13.55	65.00	4.80
0.00	0.8	6.5	6.5	0.1	18.87	0.45	0.03	2.30	19.34	65.00	3.36

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	3.6	3.6	0.0	0.56	0.26	0.73	1.16	2.01	65.00	32.28
37.50	0.5	3.6	3.7	0.1	1.81	0.26	0.73	1.12	2.35	65.00	27.68
35.00	0.5	3.7	3.7	0.2	2.94	0.26	0.73	1.09	3.42	65.00	19.01
33.00	0.5	3.8	3.8	0.2	3.80	0.26	0.73	1.07	4.29	65.00	15.16
33.00	0.5	3.8	3.8	0.2	3.80	0.26	0.24	0.47	4.10	65.00	15.86
30.00	0.5	3.8	3.9	0.3	4.59	0.26	0.24	0.43	4.87	65.00	13.34
27.50	0.5	3.9	3.9	0.4	5.14	0.26	0.24	0.39	5.42	65.00	12.00
25.00	0.5	3.9	3.9	0.4	5.59	0.26	0.24	0.36	5.87	65.00	11.08
22.50	0.5	3.9	4.0	0.4	5.95	0.26	0.24	0.33	6.22	65.00	10.45
20.00	0.5	3.9	4.0	0.4	6.20	0.26	0.24	0.30	6.47	65.00	10.04
20.00	0.5	3.9	4.0	0.4	6.20	0.26	0.25	0.31	6.47	65.00	10.04
17.50	0.5	3.9	4.0	0.4	5.94	0.26	0.25	0.34	6.22	65.00	10.46
15.00	0.5	3.9	3.9	0.4	5.59	0.26	0.25	0.37	5.86	65.00	11.09
12.50	0.5	3.9	3.9	0.4	5.13	0.26	0.25	0.40	5.41	65.00	12.01
10.00	0.5	3.8	3.9	0.3	4.58	0.26	0.25	0.44	4.87	65.00	13.36
7.00	0.5	3.8	3.8	0.2	3.79	0.26	0.25	0.48	4.09	65.00	15.90
7.00	0.5	3.8	3.8	0.2	3.79	0.26	0.73	1.07	4.28	65.00	15.19
5.00	0.5	3.7	3.7	0.2	2.91	0.26	0.73	1.10	3.41	65.00	19.05
2.50	0.5	3.6	3.7	0.1	1.77	0.26	0.73	1.13	2.34	65.00	27.74
0.00	0.5	3.6	3.6	0.0	0.51	0.26	0.73	1.16	2.02	65.00	32.18

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.7	1.7	0.0	0.68	0.02	0.21	0.63	1.24	65.00	52.55
37.50	0.2	1.7	1.7	0.1	1.03	0.02	0.21	0.60	1.29	65.00	50.35
35.00	0.2	1.7	1.8	0.2	2.23	0.02	0.21	0.56	2.27	65.00	28.59
33.00	0.2	1.8	1.8	0.2	3.13	0.02	0.21	0.54	3.16	65.00	20.57
33.00	0.2	1.8	1.8	0.2	3.13	0.03	0.07	0.30	3.15	65.00	20.61
30.00	0.2	1.8	1.8	0.3	3.90	0.03	0.07	0.26	3.92	65.00	16.56
27.50	0.2	1.9	1.9	0.3	4.43	0.03	0.07	0.22	4.46	65.00	14.58
25.00	0.2	1.9	1.9	0.4	4.87	0.03	0.07	0.19	4.89	65.00	13.28
22.50	0.2	1.9	1.9	0.4	5.20	0.03	0.07	0.15	5.23	65.00	12.43
20.00	0.2	1.9	1.9	0.4	5.44	0.03	0.07	0.12	5.47	65.00	11.88
20.00	0.2	1.9	1.9	0.4	5.44	0.03	0.07	0.13	5.47	65.00	11.88
17.50	0.2	1.9	1.9	0.4	5.20	0.03	0.07	0.16	5.23	65.00	12.43
15.00	0.2	1.9	1.9	0.4	4.87	0.03	0.07	0.19	4.89	65.00	13.29
12.50	0.2	1.9	1.9	0.3	4.43	0.03	0.07	0.22	4.46	65.00	14.59
10.00	0.2	1.8	1.8	0.3	3.90	0.03	0.07	0.26	3.92	65.00	16.58
7.00	0.2	1.8	1.8	0.2	3.12	0.03	0.07	0.30	3.15	65.00	20.64
7.00	0.2	1.8	1.8	0.2	3.12	0.02	0.21	0.54	3.16	65.00	20.60
5.00	0.2	1.7	1.8	0.2	2.23	0.02	0.21	0.57	2.27	65.00	28.65
2.50	0.2	1.7	1.7	0.1	1.02	0.02	0.21	0.60	1.30	65.00	50.04
0.00	0.2	1.7	1.7	0.0	0.70	0.02	0.21	0.63	1.25	65.00	51.98

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	483	1101	1202	230
60.00	66	-45	80	0	865	1103	1401	567
55.00	132	-109	172	0	1267	1104	1681	922
50.00	199	-198	280	0	1690	1106	2020	1296
48.00	225	-241	330	0	1865	1107	2169	1451
48.00	225	-241	330	0	1865	1107	2169	1451
45.00	265	-313	410	0	2134	1109	2405	1805
45.00	268	484	554	388	4149	6982	8121	-1692
40.00	687	222	722	388	4614	6985	8371	-1079
35.00	1106	-70	1108	388	5098	6990	8652	-436
32.00	1358	-259	1382	388	5398	6993	8835	-35
32.00	1266	-258	1292	325	5746	6805	8907	2387
30.00	1429	-399	1484	325	5952	6807	9042	2658
30.00	1429	-411	1487	325	6758	6807	9592	2880
25.00	1838	-832	2017	325	7284	6808	9970	3583
21.25	2144	-1169	2442	325	7693	6810	10275	4123
21.25	2129	-1169	2429	291	8398	6781	10794	6421
20.00	2231	-1296	2580	291	8534	6779	10899	6611
15.00	2637	-1825	3207	291	9097	6776	11343	7375
10.00	3044	-2389	3869	291	9679	6771	11812	8168
5.00	3450	-2987	4564	291	10280	6764	12306	8990
0.00	3856	-3623	5291	291	10909	6765	12837	9825

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	479	1103	1202	230
60.00	66	-45	80	0	861	1106	1401	567
55.00	133	-109	172	0	1263	1109	1681	922
50.00	199	-197	280	0	1686	1112	2020	1296
48.00	226	-240	330	0	1861	1113	2169	1450
48.00	226	-240	330	0	1861	1113	2169	1451
45.00	266	-312	410	0	2131	1116	2405	1805
45.00	263	426	501	-375	3671	6938	7850	4744
40.00	680	192	706	-375	4140	6939	8080	5359
35.00	1096	-72	1099	-375	4627	6940	8341	6003
32.00	1346	-244	1368	-375	4929	6943	8515	6401
32.00	1249	-244	1272	-310	5860	7156	9249	8821
30.00	1420	-387	1472	-310	6066	7157	9382	9091
30.00	1420	-399	1475	-310	6873	7154	9921	9313
25.00	1850	-827	2026	-310	7399	7150	10289	10016
21.25	2171	-1169	2466	-310	7809	7152	10589	10557
21.25	2151	-1169	2448	-274	8366	7193	11033	12776
20.00	2259	-1296	2604	-274	8501	7186	11131	12967
15.00	2690	-1823	3250	-274	9062	7175	11558	13731
10.00	3121	-2385	3927	-274	9641	7162	12010	14524
5.00	3550	-2981	4636	-274	10238	7147	12486	15347
0.00	3979	-3615	5376	-274	10867	7147	13007	16182

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-388	797	886	-3	3497	5871	6834	-2020
37.50	-212	690	722	-3	3632	5870	6903	-2026
35.00	-36	579	580	-3	3767	5870	6974	-2029
33.00	105	487	499	-3	3877	5869	7034	-2029
33.00	105	491	502	-3	2959	1978	3559	-837
30.00	176	381	420	-3	3123	1978	3697	-839
27.50	236	285	370	-3	3261	1978	3814	-840
25.00	295	185	348	-3	3398	1978	3932	-840
22.50	354	81	364	-3	3536	1977	4051	-840
20.00	414	-27	415	-3	3674	1977	4172	-840
20.00	414	-24	414	-3	2760	-1917	3360	348
17.50	356	-108	372	-3	2898	-1918	3475	348
15.00	299	-197	358	-3	3035	-1919	3591	347
12.50	241	-290	377	-3	3173	-1921	3709	348
10.00	183	-388	429	-3	3310	-1922	3828	349
7.00	114	-510	522	-3	3475	-1924	3973	349
7.00	114	-507	519	-3	2557	-5821	6358	1528
5.00	-26	-569	570	-3	2666	-5822	6403	1531
2.50	-200	-651	681	-3	2801	-5823	6461	1536
0.00	-375	-737	827	-3	2938	-5824	6523	1536

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	63	0	63	92	-2420	-189	2427	-347
37.50	58	71	91	92	-2283	-190	2291	-346
35.00	52	137	146	92	-2146	-191	2154	-345
33.00	47	187	193	92	-2036	-191	2045	-345
33.00	80	187	203	29	-1157	-195	1173	78
30.00	73	226	237	29	-992	-196	1012	79
27.50	67	253	262	29	-855	-197	878	80
25.00	61	277	284	29	-718	-197	744	80
22.50	55	296	302	29	-580	-198	613	81
20.00	49	312	316	29	-443	-199	485	81
20.00	82	312	322	-34	437	-203	482	501
17.50	75	296	306	-34	575	-203	610	501
15.00	69	277	286	-34	713	-204	742	501
12.50	63	254	261	-34	851	-205	875	500
10.00	57	226	233	-34	989	-206	1010	500
7.00	50	187	194	-34	1155	-207	1173	499
7.00	82	187	204	-98	2036	-212	2047	917
5.00	77	137	157	-98	2147	-213	2157	917
2.50	70	71	100	-98	2285	-214	2295	916
0.00	64	0	64	-98	2423	-215	2433	916

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	34	0	34	15	-2294	-28	2294	-705
37.50	33	67	75	15	-2156	-29	2157	-704
35.00	33	129	133	15	-2019	-29	2020	-704
33.00	32	177	179	15	-1910	-29	1910	-703
33.00	38	170	174	3	-1141	-32	1141	-284
30.00	37	208	211	3	-976	-33	977	-284
27.50	36	235	238	3	-839	-33	840	-283
25.00	35	259	261	3	-702	-34	703	-283
22.50	34	278	280	3	-565	-34	566	-282
20.00	33	292	294	3	-427	-35	429	-282
20.00	39	286	289	-9	343	-38	345	135
17.50	38	274	276	-9	480	-38	482	135
15.00	37	257	260	-9	618	-39	619	135
12.50	36	236	239	-9	756	-39	757	134
10.00	35	212	215	-9	894	-40	895	134
7.00	33	177	180	-9	1060	-41	1061	133
7.00	40	170	175	-21	1831	-44	1831	548
5.00	39	125	131	-21	1941	-44	1942	548
2.50	37	64	75	-21	2079	-45	2080	547
0.00	36	0	36	-21	2218	-46	2218	547

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.4	3.8	4.5	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	2.1	3.4	4.0	0.0	0.76	0.03	0.00	0.15	0.79	65.00	82.34
55.00	1.9	3.0	3.5	0.0	1.48	0.05	0.00	0.17	1.53	65.00	42.53
50.00	1.7	2.5	3.0	0.0	2.20	0.06	0.00	0.20	2.27	65.00	28.70
48.00	1.6	2.4	2.8	0.0	2.49	0.07	0.00	0.21	2.56	65.00	25.41
48.00	1.6	2.4	2.8	0.0	1.68	0.05	0.00	0.14	1.73	65.00	37.57
45.00	1.4	2.1	2.6	0.0	1.97	0.06	0.00	0.15	2.03	65.00	32.04
45.00	1.4	2.1	2.6	0.0	2.59	0.05	0.91	1.43	3.61	65.00	18.00
40.00	1.2	1.7	2.1	0.0	3.18	0.03	0.83	1.34	3.83	65.00	16.95
35.00	1.0	1.3	1.7	0.0	4.39	0.01	0.76	1.26	4.70	65.00	13.83
32.00	0.9	1.1	1.4	0.0	5.29	0.00	0.73	1.22	5.53	65.00	11.76
32.00	0.9	1.1	1.4	0.0	4.95	0.07	0.61	1.11	5.09	65.00	12.78
30.00	0.8	1.0	1.3	0.0	5.51	0.07	0.59	1.09	5.62	65.00	11.57
30.00	0.8	1.0	1.3	0.0	5.52	0.08	0.59	1.12	5.64	65.00	11.53
25.00	0.6	0.7	0.9	0.0	6.82	0.09	0.54	1.08	6.93	65.00	9.38
21.25	0.4	0.5	0.7	0.0	7.67	0.11	0.51	1.04	7.79	65.00	8.35
21.25	0.4	0.5	0.7	0.0	7.63	0.16	0.46	1.02	7.79	65.00	8.34
20.00	0.4	0.5	0.6	0.0	7.91	0.17	0.45	1.01	8.11	65.00	8.02
15.00	0.2	0.3	0.3	0.0	9.29	0.18	0.42	0.98	9.49	65.00	6.85
10.00	0.1	0.1	0.2	0.0	10.53	0.19	0.39	0.95	10.74	65.00	6.05
5.00	0.0	0.0	0.0	0.0	11.65	0.20	0.36	0.93	11.86	65.00	5.48
0.00	0.0	0.0	0.0	0.0	12.66	0.22	0.34	0.91	12.88	65.00	5.05

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.4	3.9	4.6	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	2.1	3.4	4.0	0.0	0.76	0.03	0.00	0.15	0.79	65.00	82.38
55.00	1.9	3.0	3.5	0.0	1.48	0.05	0.00	0.17	1.53	65.00	42.54
50.00	1.7	2.6	3.1	0.0	2.20	0.06	0.00	0.20	2.27	65.00	28.69
48.00	1.6	2.4	2.9	0.0	2.49	0.07	0.00	0.21	2.56	65.00	25.40
48.00	1.6	2.4	2.9	0.0	1.68	0.05	0.00	0.14	1.73	65.00	37.57
45.00	1.4	2.2	2.6	0.0	1.97	0.06	0.00	0.15	2.03	65.00	32.03
45.00	1.4	2.2	2.6	0.0	2.35	0.15	0.88	1.38	3.44	65.00	18.88
40.00	1.2	1.7	2.1	0.0	3.11	0.16	0.81	1.29	3.83	65.00	16.95
35.00	1.0	1.4	1.7	0.0	4.35	0.17	0.74	1.22	4.78	65.00	13.60
32.00	0.9	1.2	1.4	0.0	5.23	0.18	0.70	1.18	5.62	65.00	11.57
32.00	0.9	1.2	1.4	0.0	4.87	0.25	0.58	1.10	5.30	65.00	12.27
30.00	0.8	1.0	1.3	0.0	5.47	0.25	0.56	1.08	5.87	65.00	11.06
30.00	0.8	1.0	1.3	0.0	5.48	0.26	0.56	1.11	5.91	65.00	11.00
25.00	0.6	0.7	0.9	0.0	6.86	0.26	0.52	1.07	7.25	65.00	8.96
21.25	0.4	0.5	0.7	0.0	7.76	0.27	0.49	1.04	8.14	65.00	7.98
21.25	0.4	0.5	0.7	0.0	7.70	0.33	0.43	1.00	8.13	65.00	8.00
20.00	0.4	0.5	0.6	0.0	7.99	0.33	0.42	0.99	8.42	65.00	7.72
15.00	0.2	0.3	0.3	0.0	9.40	0.34	0.39	0.96	9.77	65.00	6.66
10.00	0.1	0.1	0.2	0.0	10.67	0.34	0.37	0.94	11.04	65.00	5.89
5.00	0.0	0.0	0.0	0.0	11.82	0.35	0.34	0.92	12.19	65.00	5.33
0.00	0.0	0.0	0.0	0.0	12.85	0.36	0.32	0.90	13.23	65.00	4.91

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.4	2.1	2.6	0.0	14.08	0.14	0.02	0.97	14.25	65.00	4.56
37.50	1.4	2.2	2.6	0.1	11.43	0.14	0.02	0.98	11.61	65.00	5.60
35.00	1.4	2.2	2.7	0.1	8.73	0.14	0.02	0.99	8.91	65.00	7.29
33.00	1.4	2.3	2.7	0.2	7.80	0.14	0.02	1.00	8.11	65.00	8.02
33.00	1.4	2.3	2.7	0.2	7.85	0.06	0.02	0.52	7.94	65.00	8.19
30.00	1.4	2.4	2.8	0.2	6.68	0.06	0.02	0.54	6.77	65.00	9.60
27.50	1.4	2.4	2.8	0.1	5.63	0.06	0.02	0.55	5.73	65.00	11.34
25.00	1.4	2.5	2.9	0.1	5.47	0.06	0.02	0.57	5.60	65.00	11.61
22.50	1.4	2.5	2.9	0.1	5.70	0.06	0.02	0.59	5.84	65.00	11.14
20.00	1.4	2.5	2.9	0.0	6.24	0.06	0.02	0.60	6.33	65.00	10.27
20.00	1.4	2.5	2.9	0.0	6.22	0.02	0.02	0.49	6.30	65.00	10.31
17.50	1.4	2.5	2.9	0.0	5.90	0.02	0.02	0.51	5.98	65.00	10.87
15.00	1.4	2.5	2.9	-0.1	5.59	0.02	0.02	0.52	5.69	65.00	11.43
12.50	1.4	2.5	2.8	-0.1	5.74	0.02	0.02	0.54	5.81	65.00	11.19
10.00	1.4	2.4	2.8	-0.1	6.82	0.02	0.02	0.56	6.88	65.00	9.44
7.00	1.4	2.3	2.7	-0.1	8.19	0.02	0.02	0.57	8.25	65.00	7.88
7.00	1.4	2.3	2.7	-0.1	8.14	0.10	0.02	0.91	8.39	65.00	7.74
5.00	1.4	2.3	2.7	-0.1	8.52	0.10	0.02	0.91	8.70	65.00	7.47
2.50	1.4	2.2	2.6	-0.1	10.79	0.10	0.02	0.92	10.95	65.00	5.94
0.00	1.4	2.2	2.6	0.0	13.12	0.10	0.02	0.93	13.27	65.00	4.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.9	1.1	1.4	0.0	0.93	0.02	0.71	1.04	2.02	65.00	32.14
37.50	0.9	1.2	1.4	0.1	1.39	0.02	0.71	1.03	2.15	65.00	30.22
35.00	0.9	1.2	1.5	0.2	2.33	0.02	0.71	1.01	2.73	65.00	23.80
33.00	0.9	1.2	1.5	0.2	3.04	0.02	0.71	0.99	3.35	65.00	19.42
33.00	0.9	1.2	1.5	0.2	3.23	0.01	0.22	0.38	3.28	65.00	19.80
30.00	0.9	1.2	1.5	0.3	3.76	0.01	0.22	0.36	3.80	65.00	17.10
27.50	0.9	1.2	1.5	0.3	4.13	0.01	0.22	0.34	4.17	65.00	15.60
25.00	0.9	1.2	1.5	0.4	4.44	0.01	0.22	0.32	4.48	65.00	14.52
22.50	0.9	1.2	1.5	0.4	4.69	0.01	0.22	0.31	4.72	65.00	13.76
20.00	0.9	1.2	1.5	0.4	4.88	0.01	0.22	0.29	4.91	65.00	13.24
20.00	0.9	1.2	1.5	0.4	5.08	0.03	0.26	0.33	5.13	65.00	12.67
17.50	0.9	1.2	1.5	0.4	4.82	0.03	0.26	0.35	4.87	65.00	13.34
15.00	0.9	1.2	1.5	0.4	4.50	0.03	0.26	0.37	4.55	65.00	14.27
12.50	0.9	1.2	1.5	0.3	4.11	0.03	0.26	0.39	4.18	65.00	15.56
10.00	0.9	1.2	1.5	0.3	3.67	0.03	0.26	0.41	3.74	65.00	17.39
7.00	0.9	1.2	1.5	0.2	3.06	0.03	0.26	0.43	3.13	65.00	20.74
7.00	0.9	1.2	1.5	0.2	3.25	0.06	0.75	1.03	3.61	65.00	17.99
5.00	0.9	1.2	1.5	0.2	2.48	0.06	0.75	1.05	2.93	65.00	22.18
2.50	0.9	1.2	1.5	0.1	1.47	0.06	0.75	1.07	2.35	65.00	27.63
0.00	0.9	1.2	1.4	0.0	0.94	0.06	0.75	1.09	2.14	65.00	30.43

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	0.5	0.7	0.0	0.50	0.05	0.12	0.44	0.88	65.00	73.55
37.50	0.4	0.5	0.7	0.1	1.18	0.05	0.12	0.42	1.23	65.00	52.75
35.00	0.4	0.5	0.7	0.2	2.10	0.05	0.12	0.40	2.15	65.00	30.26
33.00	0.4	0.5	0.7	0.2	2.79	0.05	0.12	0.38	2.84	65.00	22.91
33.00	0.4	0.5	0.7	0.2	2.73	0.02	0.03	0.18	2.75	65.00	23.61
30.00	0.4	0.6	0.7	0.3	3.29	0.02	0.03	0.16	3.31	65.00	19.66
27.50	0.4	0.6	0.7	0.3	3.68	0.02	0.03	0.14	3.70	65.00	17.57
25.00	0.4	0.6	0.7	0.4	4.01	0.02	0.03	0.12	4.03	65.00	16.12
22.50	0.4	0.6	0.7	0.4	4.29	0.02	0.03	0.10	4.31	65.00	15.10
20.00	0.4	0.6	0.7	0.4	4.50	0.02	0.03	0.09	4.52	65.00	14.39
20.00	0.4	0.6	0.7	0.4	4.44	0.01	0.07	0.11	4.45	65.00	14.59
17.50	0.4	0.6	0.7	0.4	4.25	0.01	0.07	0.13	4.27	65.00	15.24
15.00	0.4	0.6	0.7	0.4	4.01	0.01	0.07	0.15	4.02	65.00	16.18
12.50	0.4	0.6	0.7	0.3	3.70	0.01	0.07	0.17	3.71	65.00	17.53
10.00	0.4	0.6	0.7	0.3	3.32	0.01	0.07	0.19	3.34	65.00	19.47
7.00	0.4	0.6	0.7	0.2	2.80	0.01	0.07	0.21	2.81	65.00	23.10
7.00	0.4	0.6	0.7	0.2	2.74	0.04	0.16	0.41	2.81	65.00	23.11
5.00	0.4	0.6	0.7	0.2	2.07	0.04	0.16	0.43	2.15	65.00	30.19
2.50	0.4	0.5	0.7	0.1	1.18	0.04	0.16	0.45	1.29	65.00	50.20
0.00	0.4	0.5	0.7	0.0	0.53	0.04	0.16	0.47	0.99	65.00	65.79

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	403	1182	1249	223
60.00	87	-24	91	0	405	1567	1619	559
55.00	194	-49	200	0	406	1973	2015	915
50.00	325	-73	333	0	408	2400	2434	1289
48.00	384	-83	393	0	408	2577	2609	1444
48.00	384	-83	393	0	408	2576	2608	1444
45.00	482	-98	492	0	409	2849	2878	1798
45.00	487	194	525	459	2337	10513	10770	392
40.00	1132	54	1134	459	2339	10984	11231	1005
35.00	1806	-86	1808	459	2334	11476	11711	1662
32.00	2225	-170	2231	459	2335	11781	12010	2060
32.00	2130	-170	2136	498	2005	13770	13915	4466
30.00	2463	-218	2472	498	2006	13977	14120	4736
30.00	2475	-218	2484	498	2004	14783	14918	4961
25.00	3378	-338	3395	498	2001	15309	15439	5676
21.25	4076	-428	4098	498	2002	15721	15848	6217
21.25	4048	-428	4071	586	2078	17742	17863	8468
20.00	4315	-459	4340	586	2074	17873	17993	8671
15.00	5405	-583	5436	586	2069	18428	18544	9458
10.00	6528	-707	6567	586	2063	19000	19111	10276
5.00	7687	-830	7732	586	2056	19587	19695	11126
0.00	8881	-954	8932	586	2057	20217	20321	11961

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	397	1184	1249	223
60.00	87	-24	91	0	397	1570	1619	559
55.00	194	-48	200	0	396	1975	2015	915
50.00	325	-71	333	0	395	2402	2434	1289
48.00	385	-81	393	0	395	2579	2609	1444
48.00	385	-81	393	0	395	2578	2608	1444
45.00	483	-95	492	0	395	2851	2878	1798
45.00	487	127	504	-461	1766	10525	10672	2534
40.00	1133	21	1133	-461	1770	10993	11135	3155
35.00	1807	-85	1809	-461	1773	11481	11618	3804
32.00	2226	-149	2231	-461	1773	11786	11919	4202
32.00	2131	-149	2136	-501	2108	13778	13938	6607
30.00	2464	-200	2472	-501	2108	13985	14143	6877
30.00	2476	-200	2484	-501	2109	14788	14938	7102
25.00	3379	-327	3395	-501	2112	15311	15455	7817
21.25	4077	-422	4099	-501	2112	15723	15864	8358
21.25	4049	-422	4071	-589	2039	17744	17861	10610
20.00	4317	-452	4340	-589	2041	17872	17988	10813
15.00	5406	-575	5437	-589	2043	18422	18535	11599
10.00	6529	-698	6566	-589	2045	18988	19098	12417
5.00	7687	-821	7730	-589	2046	19570	19677	13267
0.00	8880	-944	8930	-589	2046	20200	20303	14102

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-459	292	544	-5	1409	7664	7792	-1932
37.50	-233	247	340	-5	1543	7449	7607	-1936
35.00	-12	199	199	-5	1678	7235	7427	-1936
33.00	159	158	224	-5	1785	7064	7286	-1937
33.00	159	158	224	-2	842	3095	3207	-823
30.00	266	124	294	-2	1003	2838	3010	-823
27.50	348	92	360	-2	1138	2625	2861	-822
25.00	423	56	427	-2	1272	2411	2727	-821
22.50	493	16	493	-2	1407	2198	2610	-819
20.00	555	-28	556	-2	1542	1985	2514	-817
20.00	555	-28	556	1	599	-1988	2076	283
17.50	493	-48	495	1	734	-2202	2321	283
15.00	423	-72	429	1	869	-2416	2567	281
12.50	348	-100	362	1	1003	-2630	2815	280
10.00	266	-133	297	1	1138	-2844	3063	278
7.00	159	-176	237	1	1300	-3100	3362	277
7.00	159	-176	237	5	356	-7077	7086	1363
5.00	-13	-186	187	5	464	-7248	7263	1363
2.50	-234	-202	309	5	598	-7461	7485	1367
0.00	-461	-222	512	5	733	-7675	7710	1367

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-39	0	39	95	-2400	1990	3117	324
37.50	17	70	72	95	-2264	1776	2878	324
35.00	67	136	152	95	-2129	1562	2641	325
33.00	103	186	212	95	-2021	1391	2454	326
33.00	103	186	212	32	-1143	1202	1659	329
30.00	142	224	265	32	-981	946	1363	330
27.50	167	251	302	32	-846	732	1119	330
25.00	186	275	331	32	-710	519	879	331
22.50	198	294	354	32	-575	305	651	331
20.00	204	309	370	32	-439	92	449	331
20.00	204	309	370	-32	439	-97	450	331
17.50	198	294	354	-32	575	-310	653	331
15.00	185	275	331	-32	710	-524	882	331
12.50	166	251	301	-32	846	-737	1122	330
10.00	141	224	265	-32	981	-951	1366	330
7.00	102	186	212	-32	1143	-1207	1663	329
7.00	102	186	212	-95	2021	-1396	2457	326
5.00	67	136	151	-95	2129	-1567	2644	325
2.50	16	70	72	-95	2264	-1781	2881	324
0.00	-40	0	40	-95	2400	-1995	3120	324

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-88	0	88	28	-2239	2026	3019	-83
37.50	-30	65	72	28	-2103	1813	2777	-82
35.00	21	126	128	28	-1967	1600	2536	-82
33.00	57	172	181	28	-1859	1429	2345	-81
33.00	57	172	181	9	-1090	1214	1632	-79
30.00	96	208	230	9	-927	959	1334	-79
27.50	122	234	264	9	-792	745	1087	-78
25.00	141	256	292	9	-656	532	845	-77
22.50	154	274	314	9	-520	319	610	-77
20.00	160	287	329	9	-384	106	399	-76
20.00	160	287	329	-9	384	-108	399	-76
17.50	154	274	314	-9	520	-322	611	-77
15.00	141	256	292	-9	656	-535	846	-77
12.50	122	234	264	-9	792	-748	1089	-78
10.00	96	208	229	-9	927	-961	1335	-79
7.00	57	172	181	-9	1090	-1216	1634	-79
7.00	57	172	181	-28	1859	-1431	2346	-81
5.00	20	126	128	-28	1967	-1602	2537	-82
2.50	-31	65	72	-28	2103	-1815	2778	-82
0.00	-89	0	89	-28	2239	-2028	3021	-83

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	7.7	7.7	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	0.7	6.9	6.9	0.0	0.87	0.03	0.00	0.18	0.90	65.00	72.00
55.00	0.6	6.0	6.0	0.0	1.73	0.05	0.00	0.21	1.78	65.00	36.58
50.00	0.5	5.2	5.2	0.0	2.61	0.06	0.00	0.24	2.67	65.00	24.31
48.00	0.5	4.8	4.9	0.0	2.97	0.07	0.00	0.25	3.04	65.00	21.41
48.00	0.5	4.8	4.9	0.0	2.01	0.05	0.00	0.17	2.05	65.00	31.66
45.00	0.4	4.4	4.4	0.0	2.37	0.06	0.00	0.18	2.43	65.00	26.80
45.00	0.4	4.4	4.4	0.0	2.51	0.01	1.08	1.76	3.68	65.00	17.65
40.00	0.4	3.6	3.6	0.0	4.88	0.03	0.99	1.66	5.34	65.00	12.17
35.00	0.3	2.8	2.8	0.0	7.13	0.05	0.91	1.58	7.36	65.00	8.83
32.00	0.3	2.4	2.4	0.0	8.42	0.06	0.86	1.54	8.62	65.00	7.54
32.00	0.3	2.4	2.4	0.0	8.06	0.12	0.93	1.71	8.38	65.00	7.76
30.00	0.2	2.1	2.2	0.0	9.04	0.13	0.90	1.68	9.33	65.00	6.96
30.00	0.2	2.1	2.2	0.0	9.09	0.14	0.90	1.72	9.39	65.00	6.93
25.00	0.2	1.5	1.5	0.0	11.48	0.15	0.83	1.65	11.74	65.00	5.53
21.25	0.1	1.1	1.1	0.0	13.09	0.16	0.79	1.60	13.34	65.00	4.87
21.25	0.1	1.1	1.1	0.0	13.00	0.22	0.93	1.85	13.34	65.00	4.87
20.00	0.1	1.0	1.0	0.0	13.60	0.22	0.91	1.83	13.94	65.00	4.66
15.00	0.1	0.6	0.6	0.0	15.82	0.23	0.84	1.76	16.14	65.00	4.03
10.00	0.0	0.3	0.3	0.0	17.79	0.24	0.79	1.69	18.10	65.00	3.59
5.00	0.0	0.1	0.1	0.0	19.54	0.25	0.73	1.64	19.86	65.00	3.27
0.00	0.0	0.0	0.0	0.0	21.12	0.26	0.69	1.59	21.43	65.00	3.03

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	7.7	7.7	0.1	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	0.7	6.9	6.9	0.0	0.87	0.03	0.00	0.18	0.90	65.00	72.00
55.00	0.6	6.0	6.0	0.0	1.73	0.05	0.00	0.21	1.78	65.00	36.58
50.00	0.5	5.2	5.2	0.0	2.61	0.06	0.00	0.24	2.67	65.00	24.32
48.00	0.5	4.8	4.9	0.0	2.97	0.07	0.00	0.25	3.04	65.00	21.42
48.00	0.5	4.8	4.9	0.0	2.01	0.05	0.00	0.17	2.05	65.00	31.67
45.00	0.4	4.4	4.4	0.0	2.37	0.06	0.00	0.18	2.42	65.00	26.81
45.00	0.4	4.4	4.4	0.0	2.43	0.08	1.09	1.76	3.57	65.00	18.21
40.00	0.4	3.6	3.6	0.0	4.84	0.09	0.99	1.66	5.40	65.00	12.03
35.00	0.3	2.8	2.8	0.0	7.14	0.11	0.91	1.58	7.39	65.00	8.80
32.00	0.3	2.4	2.4	0.0	8.40	0.12	0.86	1.53	8.63	65.00	7.54
32.00	0.3	2.4	2.4	0.0	8.05	0.18	0.94	1.72	8.36	65.00	7.77
30.00	0.2	2.1	2.2	0.0	9.03	0.19	0.91	1.69	9.33	65.00	6.97
30.00	0.2	2.1	2.2	0.0	9.07	0.19	0.91	1.73	9.37	65.00	6.94
25.00	0.2	1.5	1.5	0.0	11.47	0.21	0.84	1.66	11.75	65.00	5.53
21.25	0.1	1.1	1.1	0.0	13.09	0.21	0.79	1.61	13.35	65.00	4.87
21.25	0.1	1.1	1.1	0.0	13.00	0.27	0.93	1.85	13.34	65.00	4.87
20.00	0.1	1.0	1.0	0.0	13.60	0.27	0.91	1.83	13.94	65.00	4.66
15.00	0.1	0.6	0.6	0.0	15.82	0.28	0.85	1.76	16.15	65.00	4.03
10.00	0.0	0.3	0.3	0.0	17.78	0.29	0.79	1.70	18.11	65.00	3.59
5.00	0.0	0.1	0.1	0.0	19.54	0.30	0.74	1.64	19.87	65.00	3.27
0.00	0.0	0.0	0.0	0.0	21.11	0.31	0.69	1.59	21.44	65.00	3.03

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	4.4	4.4	0.0	8.53	0.13	0.04	1.13	8.67	65.00	7.50
37.50	0.4	4.4	4.5	0.1	5.05	0.13	0.04	1.10	5.38	65.00	12.07
35.00	0.4	4.5	4.6	0.1	3.00	0.13	0.04	1.08	3.49	65.00	18.63
33.00	0.4	4.6	4.6	0.1	3.30	0.13	0.04	1.05	3.80	65.00	17.09
33.00	0.4	4.6	4.6	0.1	3.30	0.06	0.01	0.46	3.42	65.00	18.99
30.00	0.4	4.7	4.8	0.1	4.67	0.06	0.01	0.43	4.75	65.00	13.70
27.50	0.4	4.8	4.8	0.1	5.68	0.06	0.01	0.41	5.75	65.00	11.30
25.00	0.4	4.9	4.9	0.1	6.57	0.06	0.01	0.39	6.64	65.00	9.79
22.50	0.4	4.9	4.9	0.0	7.34	0.06	0.01	0.38	7.41	65.00	8.77
20.00	0.4	4.9	4.9	0.0	8.34	0.06	0.01	0.36	8.39	65.00	7.74
20.00	0.4	4.9	4.9	0.0	8.34	0.02	0.01	0.30	8.36	65.00	7.77
17.50	0.4	4.9	4.9	0.0	7.53	0.02	0.01	0.33	7.56	65.00	8.60
15.00	0.4	4.9	4.9	0.0	6.66	0.02	0.01	0.37	6.69	65.00	9.71
12.50	0.4	4.8	4.8	0.0	5.72	0.02	0.01	0.40	5.76	65.00	11.29
10.00	0.4	4.7	4.8	0.0	4.71	0.02	0.01	0.44	4.76	65.00	13.67
7.00	0.4	4.6	4.6	0.0	3.56	0.02	0.01	0.48	3.67	65.00	17.74
7.00	0.4	4.6	4.6	0.0	3.56	0.09	0.04	1.02	3.97	65.00	16.38
5.00	0.4	4.5	4.6	0.0	2.82	0.09	0.04	1.05	3.31	65.00	19.67
2.50	0.4	4.4	4.5	0.0	4.67	0.09	0.04	1.08	4.79	65.00	13.57
0.00	0.4	4.4	4.4	0.0	8.13	0.09	0.04	1.11	8.24	65.00	7.89

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.4	2.4	0.0	0.58	0.02	0.73	1.16	2.06	65.00	31.50
37.50	0.3	2.5	2.5	0.1	1.13	0.02	0.73	1.13	2.07	65.00	31.39
35.00	0.3	2.5	2.5	0.2	2.41	0.02	0.73	1.10	2.77	65.00	23.45
33.00	0.3	2.5	2.6	0.2	3.36	0.02	0.73	1.07	3.61	65.00	18.01
33.00	0.3	2.5	2.6	0.2	3.35	0.02	0.24	0.47	3.39	65.00	19.19
30.00	0.3	2.6	2.6	0.3	4.15	0.02	0.24	0.43	4.19	65.00	15.53
27.50	0.3	2.6	2.6	0.4	4.71	0.02	0.24	0.40	4.74	65.00	13.71
25.00	0.3	2.6	2.7	0.4	5.17	0.02	0.24	0.36	5.20	65.00	12.50
22.50	0.3	2.7	2.7	0.4	5.52	0.02	0.24	0.33	5.56	65.00	11.69
20.00	0.3	2.7	2.7	0.4	5.78	0.02	0.24	0.30	5.82	65.00	11.16
20.00	0.3	2.7	2.7	0.4	5.78	0.02	0.24	0.31	5.82	65.00	11.16
17.50	0.3	2.7	2.7	0.4	5.52	0.02	0.24	0.33	5.56	65.00	11.69
15.00	0.3	2.6	2.7	0.4	5.16	0.02	0.24	0.37	5.20	65.00	12.50
12.50	0.3	2.6	2.6	0.4	4.71	0.02	0.24	0.40	4.74	65.00	13.71
10.00	0.3	2.6	2.6	0.3	4.15	0.02	0.24	0.43	4.18	65.00	15.54
7.00	0.3	2.5	2.6	0.2	3.35	0.02	0.24	0.48	3.38	65.00	19.22
7.00	0.3	2.5	2.6	0.2	3.35	0.02	0.73	1.07	3.61	65.00	18.02
5.00	0.3	2.5	2.5	0.2	2.40	0.02	0.73	1.10	2.77	65.00	23.47
2.50	0.3	2.5	2.5	0.1	1.13	0.02	0.73	1.13	2.08	65.00	31.29
0.00	0.3	2.4	2.4	0.0	0.59	0.02	0.73	1.16	2.07	65.00	31.40

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.1	1.1	0.0	1.29	0.01	0.21	0.63	1.67	65.00	38.89
37.50	0.1	1.2	1.2	0.1	1.14	0.01	0.21	0.60	1.50	65.00	43.36
35.00	0.1	1.2	1.2	0.2	1.98	0.01	0.21	0.56	2.06	65.00	31.57
33.00	0.1	1.2	1.2	0.2	2.88	0.01	0.21	0.54	2.93	65.00	22.20
33.00	0.1	1.2	1.2	0.2	2.88	0.01	0.07	0.30	2.90	65.00	22.43
30.00	0.1	1.3	1.3	0.3	3.65	0.01	0.07	0.26	3.66	65.00	17.74
27.50	0.1	1.3	1.3	0.3	4.18	0.01	0.07	0.22	4.19	65.00	15.50
25.00	0.1	1.3	1.3	0.4	4.62	0.01	0.07	0.19	4.63	65.00	14.04
22.50	0.1	1.3	1.3	0.4	4.96	0.01	0.07	0.16	4.96	65.00	13.09
20.00	0.1	1.3	1.3	0.4	5.20	0.01	0.07	0.13	5.20	65.00	12.50
17.50	0.1	1.3	1.3	0.4	4.96	0.01	0.07	0.16	4.96	65.00	13.09
15.00	0.1	1.3	1.3	0.4	4.62	0.01	0.07	0.19	4.63	65.00	14.05
12.50	0.1	1.3	1.3	0.3	4.18	0.01	0.07	0.22	4.19	65.00	15.50
10.00	0.1	1.3	1.3	0.3	3.65	0.01	0.07	0.26	3.66	65.00	17.75
7.00	0.1	1.2	1.2	0.2	2.88	0.01	0.07	0.30	2.90	65.00	22.45
7.00	0.1	1.2	1.2	0.2	2.88	0.01	0.21	0.54	2.93	65.00	22.21
5.00	0.1	1.2	1.2	0.2	1.98	0.01	0.21	0.56	2.06	65.00	31.60
2.50	0.1	1.2	1.2	0.1	1.15	0.01	0.21	0.60	1.50	65.00	43.27
0.00	0.1	1.1	1.1	0.0	1.30	0.01	0.21	0.63	1.68	65.00	38.73

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	415	2330	2367	1553
60.00	140	-25	142	0	416	2336	2373	1890
55.00	280	-50	285	0	416	2342	2379	2246
50.00	421	-75	428	0	417	2349	2386	2620
48.00	478	-85	485	0	417	2352	2389	2775
48.00	478	-85	485	0	417	2351	2388	2776
45.00	562	-100	571	0	418	2358	2395	3130
45.00	563	-449	720	1146	-2287	19928	20059	10112
40.00	1759	-311	1787	1146	-2307	19926	20059	10746
35.00	2955	-172	2960	1146	-2320	19921	20056	11410
32.00	3673	-89	3674	1146	-2319	19928	20062	11808
32.00	3460	-88	3461	954	3683	19959	20296	15887
30.00	3939	-177	3943	954	3684	19963	20300	16158
30.00	3939	-176	3943	954	3675	19950	20286	16740
25.00	5136	-396	5151	954	3664	19928	20262	17475
21.25	6033	-561	6059	954	3665	19935	20269	18015
21.25	6010	-561	6036	848	2933	19942	20157	20640
20.00	6309	-605	6338	848	2925	19913	20127	20855
15.00	7504	-779	7544	848	2913	19865	20078	21659
10.00	8696	-954	8748	848	2900	19812	20023	22492
5.00	9885	-1127	9949	848	2887	19752	19962	23355
0.00	11070	-1300	11146	848	2888	19753	19963	24190

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	390	2334	2366	1554
60.00	140	-23	142	0	391	2340	2373	1891
55.00	281	-47	285	0	391	2347	2379	2246
50.00	422	-70	428	0	391	2353	2385	2621
48.00	478	-80	485	0	392	2356	2388	2775
48.00	478	-80	485	0	391	2355	2388	2776
45.00	563	-94	571	0	392	2362	2394	3130
45.00	563	928	1085	-1150	7923	19952	21468	12896
40.00	1760	452	1817	-1150	7946	19942	21467	13528
35.00	2957	-26	2957	-1150	7961	19931	21462	14193
32.00	3675	-312	3688	-1150	7962	19937	21468	14591
32.00	3462	-313	3476	-959	1970	19973	20070	18689
30.00	3941	-360	3957	-959	1971	19977	20074	18960
30.00	3941	-360	3957	-959	1977	19958	20055	19542
25.00	5139	-479	5161	-959	1984	19928	20026	20276
21.25	6036	-569	6062	-959	1985	19934	20033	20817
21.25	6013	-569	6040	-854	2719	19941	20125	23440
20.00	6312	-610	6341	-854	2720	19906	20091	23655
15.00	7506	-774	7546	-854	2722	19849	20035	24458
10.00	8697	-938	8748	-854	2722	19786	19972	25292
5.00	9884	-1102	9946	-854	2720	19717	19903	26154
0.00	11068	-1265	11140	-854	2721	19718	19905	26989

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1146	-348	1198	-1	-6975	17577	18910	2679
37.50	-619	-141	635	-1	-6837	17575	18858	2680
35.00	-92	62	111	-1	-6700	17575	18809	2657
33.00	330	221	397	-1	-6590	17573	18768	2657
33.00	330	221	397	-1	-1747	5889	6142	4354
30.00	542	281	610	-1	-1580	5881	6090	4361
27.50	718	326	789	-1	-1440	5873	6047	4369
25.00	894	368	967	-1	-1299	5864	6006	4378
22.50	1070	405	1144	-1	-1159	5854	5967	4390
20.00	1246	437	1320	-1	-1021	5851	5939	4390
20.00	1246	437	1320	-1	3829	-5853	6994	5985
17.50	1070	320	1117	-1	3966	-5856	7073	5985
15.00	894	199	916	-1	4107	-5869	7163	5972
12.50	718	74	722	-1	4247	-5881	7254	5962
10.00	541	-56	544	-1	4385	-5891	7344	5954
7.00	329	-217	394	-1	4549	-5899	7450	5948
7.00	329	-217	394	-1	9395	-17607	19957	7457
5.00	-94	-443	453	-1	9500	-17608	20007	7468
2.50	-622	-730	959	-1	9628	-17603	20064	7498
0.00	-1150	-1021	1538	-1	9765	-17605	20132	7498

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	192	0	192	214	-4043	44	4043	-6023
37.50	193	119	227	214	-3907	42	3907	-6021
35.00	194	234	305	214	-3769	39	3769	-6021
33.00	195	324	378	214	-3661	38	3661	-6019
33.00	196	323	378	71	-1684	11	1685	-6010
30.00	196	381	429	71	-1519	8	1519	-6009
27.50	196	425	468	71	-1386	8	1386	-6008
25.00	197	464	504	71	-1253	8	1253	-6007
22.50	197	500	537	71	-1120	8	1120	-6006
20.00	197	532	567	71	-987	8	987	-6005
20.00	197	532	567	-72	987	-17	987	-6005
17.50	197	500	537	-72	1120	-17	1120	-6006
15.00	196	464	504	-72	1253	-17	1253	-6007
12.50	196	425	468	-72	1386	-17	1386	-6008
10.00	195	381	428	-72	1519	-17	1519	-6009
7.00	194	323	377	-72	1684	-20	1685	-6010
7.00	194	324	377	-214	3661	-47	3661	-6019
5.00	193	234	303	-214	3769	-49	3769	-6021
2.50	191	119	225	-214	3907	-51	3907	-6021
0.00	190	0	190	-214	4043	-53	4043	-6023

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	106	0	106	23	-2603	28	2603	721
37.50	107	76	131	23	-2465	26	2465	721
35.00	108	148	183	23	-2327	25	2327	722
33.00	108	202	230	23	-2217	23	2217	722
33.00	108	202	230	8	-1217	12	1217	725
30.00	109	243	266	8	-1052	10	1052	726
27.50	109	273	294	8	-914	9	914	727
25.00	109	298	317	8	-776	7	776	728
22.50	109	319	338	8	-638	5	638	728
20.00	110	336	354	8	-500	4	500	728
20.00	110	336	354	-8	500	-7	500	728
17.50	109	319	337	-8	638	-9	638	728
15.00	109	298	317	-8	776	-11	776	728
12.50	109	273	294	-8	914	-12	914	727
10.00	108	243	266	-8	1052	-14	1052	726
7.00	108	202	229	-8	1217	-16	1217	725
7.00	108	202	229	-23	2217	-27	2217	722
5.00	107	148	183	-23	2327	-28	2327	722
2.50	106	76	131	-23	2465	-30	2465	721
0.00	105	0	105	-23	2603	-32	2603	721

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	10.7	10.8	0.1	0.00	0.09	0.00	0.27	0.48	65.00	99.90
60.00	1.0	9.5	9.6	0.1	1.36	0.10	0.00	0.26	1.47	65.00	44.30
55.00	0.8	8.3	8.4	0.1	2.46	0.12	0.00	0.25	2.58	65.00	25.23
50.00	0.7	7.1	7.2	0.1	3.34	0.13	0.00	0.24	3.47	65.00	18.71
48.00	0.7	6.7	6.7	0.1	3.65	0.13	0.00	0.23	3.78	65.00	17.18
48.00	0.7	6.7	6.7	0.1	2.47	0.09	0.00	0.15	2.56	65.00	25.41
45.00	0.6	6.0	6.0	0.1	2.75	0.10	0.00	0.15	2.84	65.00	22.86
45.00	0.6	6.0	6.0	0.1	3.45	0.32	2.70	3.96	7.52	65.00	8.64
40.00	0.5	4.9	4.9	0.0	7.84	0.32	2.46	3.67	9.59	65.00	6.78
35.00	0.4	3.8	3.8	0.0	11.70	0.33	2.26	3.41	12.90	65.00	5.04
32.00	0.3	3.2	3.2	0.0	13.70	0.33	2.15	3.27	14.72	65.00	4.42
32.00	0.3	3.2	3.2	0.0	12.91	0.44	1.79	2.93	13.75	65.00	4.73
30.00	0.3	2.9	2.9	0.0	14.30	0.44	1.73	2.85	15.07	65.00	4.31
30.00	0.3	2.9	2.9	0.0	14.30	0.46	1.73	2.85	15.09	65.00	4.31
25.00	0.2	2.0	2.0	0.0	17.35	0.46	1.60	2.67	18.05	65.00	3.60
21.25	0.2	1.5	1.5	0.0	19.31	0.46	1.51	2.55	19.96	65.00	3.26
21.25	0.2	1.5	1.5	0.0	19.24	0.53	1.34	2.38	19.93	65.00	3.26
20.00	0.1	1.3	1.3	0.0	19.83	0.53	1.31	2.34	20.51	65.00	3.17
15.00	0.1	0.7	0.7	0.0	21.94	0.53	1.22	2.21	22.59	65.00	2.88
10.00	0.0	0.3	0.3	0.0	23.71	0.53	1.14	2.09	24.33	65.00	2.67
5.00	0.0	0.1	0.1	0.0	25.17	0.53	1.06	1.98	25.79	65.00	2.52
0.00	0.0	0.0	0.0	0.0	26.39	0.53	0.99	1.88	26.99	65.00	2.41

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	10.7	10.8	0.1	0.00	0.09	0.00	0.27	0.48	65.00	99.90
60.00	0.8	9.5	9.5	0.1	1.36	0.10	0.00	0.26	1.47	65.00	44.34
55.00	0.7	8.3	8.3	0.1	2.46	0.12	0.00	0.25	2.57	65.00	25.26
50.00	0.7	7.1	7.2	0.1	3.34	0.13	0.00	0.23	3.47	65.00	18.73
48.00	0.6	6.7	6.7	0.1	3.65	0.13	0.00	0.23	3.78	65.00	17.20
48.00	0.6	6.7	6.7	0.1	2.47	0.09	0.00	0.15	2.56	65.00	25.44
45.00	0.6	6.0	6.0	0.1	2.74	0.10	0.00	0.15	2.84	65.00	22.88
45.00	0.6	6.0	6.0	0.1	5.09	0.40	2.71	4.05	8.89	65.00	7.31
40.00	0.5	4.9	4.9	0.0	8.00	0.40	2.47	3.76	10.12	65.00	6.43
35.00	0.4	3.8	3.8	0.0	11.56	0.41	2.27	3.50	13.00	65.00	5.00
32.00	0.3	3.2	3.2	0.0	13.93	0.41	2.16	3.36	14.88	65.00	4.37
32.00	0.3	3.2	3.2	0.0	13.14	0.52	1.80	2.92	13.95	65.00	4.66
30.00	0.3	2.9	2.9	0.0	14.48	0.52	1.74	2.85	15.24	65.00	4.26
30.00	0.3	2.9	2.9	0.0	14.48	0.54	1.74	2.85	15.26	65.00	4.26
25.00	0.2	2.0	2.0	0.0	17.43	0.53	1.61	2.67	18.14	65.00	3.58
21.25	0.2	1.5	1.5	0.0	19.32	0.53	1.52	2.55	19.99	65.00	3.25
21.25	0.2	1.5	1.5	0.0	19.25	0.60	1.35	2.38	19.97	65.00	3.26
20.00	0.1	1.3	1.3	0.0	19.84	0.60	1.32	2.35	20.55	65.00	3.16
15.00	0.1	0.7	0.7	0.0	21.94	0.60	1.23	2.21	22.62	65.00	2.87
10.00	0.0	0.3	0.3	0.0	23.70	0.60	1.15	2.09	24.36	65.00	2.67
5.00	0.0	0.1	0.1	0.0	25.16	0.60	1.07	1.98	25.80	65.00	2.52
0.00	0.0	0.0	0.0	0.0	26.36	0.59	1.00	1.88	27.00	65.00	2.41

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	6.0	6.0	0.1	18.97	0.18	0.01	2.64	19.16	65.00	3.39
37.50	0.6	6.2	6.2	0.1	9.96	0.18	0.01	2.63	10.14	65.00	6.41
35.00	0.6	6.4	6.4	0.2	1.73	0.18	0.01	2.62	4.84	65.00	13.44
33.00	0.6	6.5	6.6	0.3	6.20	0.18	0.01	2.62	6.38	65.00	10.19
33.00	0.6	6.5	6.6	0.3	6.20	0.30	0.01	0.86	6.50	65.00	10.01
30.00	0.6	6.8	6.8	0.3	9.68	0.30	0.01	0.85	9.98	65.00	6.52
27.50	0.6	6.9	7.0	0.4	12.55	0.30	0.01	0.85	12.85	65.00	5.06
25.00	0.6	7.1	7.1	0.4	15.39	0.30	0.01	0.84	15.69	65.00	4.14
22.50	0.6	7.1	7.2	0.4	18.20	0.30	0.01	0.84	18.50	65.00	3.51
20.00	0.6	7.2	7.2	0.4	20.98	0.30	0.01	0.83	21.28	65.00	3.05
20.00	0.6	7.2	7.2	0.4	20.98	0.41	0.01	0.98	21.39	65.00	3.04
17.50	0.6	7.1	7.2	0.4	17.68	0.41	0.01	0.99	18.09	65.00	3.59
15.00	0.6	7.1	7.1	0.3	14.36	0.41	0.01	1.01	14.77	65.00	4.40
12.50	0.6	6.9	7.0	0.3	11.00	0.41	0.01	1.02	11.41	65.00	5.69
10.00	0.6	6.8	6.8	0.2	8.29	0.40	0.01	1.03	8.83	65.00	7.36
7.00	0.6	6.5	6.6	0.1	6.15	0.40	0.01	1.04	6.74	65.00	9.64
7.00	0.6	6.5	6.6	0.1	6.15	0.51	0.01	2.78	7.72	65.00	8.42
5.00	0.6	6.4	6.4	0.1	7.09	0.51	0.01	2.78	8.22	65.00	7.91
2.50	0.6	6.2	6.2	0.0	14.52	0.51	0.01	2.79	15.34	65.00	4.24
0.00	0.6	6.0	6.0	0.1	23.12	0.51	0.01	2.80	23.64	65.00	2.75

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	3.2	3.2	0.0	2.82	0.41	1.64	2.20	4.51	65.00	14.41
37.50	0.3	3.3	3.3	0.2	3.57	0.41	1.64	2.18	4.86	65.00	13.36
35.00	0.3	3.4	3.4	0.3	4.63	0.41	1.64	2.16	5.62	65.00	11.56
33.00	0.3	3.4	3.4	0.4	5.95	0.41	1.64	2.15	6.83	65.00	9.52
33.00	0.3	3.4	3.4	0.4	5.95	0.41	0.54	0.78	6.40	65.00	10.15
30.00	0.3	3.5	3.5	0.5	6.80	0.41	0.54	0.76	7.25	65.00	8.97
27.50	0.3	3.5	3.5	0.6	7.44	0.41	0.54	0.74	7.89	65.00	8.24
25.00	0.3	3.5	3.5	0.7	8.02	0.41	0.54	0.72	8.47	65.00	7.67
22.50	0.3	3.5	3.5	0.7	8.55	0.41	0.54	0.70	9.00	65.00	7.22
20.00	0.3	3.5	3.6	0.7	9.02	0.41	0.54	0.68	9.46	65.00	6.87
20.00	0.3	3.5	3.6	0.7	9.02	0.41	0.55	0.69	9.46	65.00	6.87
17.50	0.3	3.5	3.5	0.7	8.55	0.41	0.55	0.70	9.00	65.00	7.23
15.00	0.3	3.5	3.5	0.7	8.02	0.41	0.55	0.72	8.47	65.00	7.67
12.50	0.3	3.5	3.5	0.6	7.43	0.41	0.55	0.74	7.89	65.00	8.24
10.00	0.3	3.5	3.5	0.5	6.79	0.41	0.55	0.76	7.24	65.00	8.97
7.00	0.3	3.4	3.4	0.4	5.94	0.41	0.55	0.78	6.40	65.00	10.16
7.00	0.3	3.4	3.4	0.4	5.94	0.41	1.64	2.15	6.83	65.00	9.52
5.00	0.3	3.4	3.4	0.3	4.62	0.41	1.64	2.17	5.62	65.00	11.57
2.50	0.3	3.3	3.3	0.2	3.54	0.41	1.64	2.19	4.85	65.00	13.40
0.00	0.3	3.2	3.2	0.0	2.79	0.41	1.64	2.21	4.50	65.00	14.44

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.5	1.5	0.0	1.56	0.05	0.18	0.54	1.86	65.00	34.93
37.50	0.2	1.5	1.5	0.1	2.03	0.05	0.18	0.52	2.25	65.00	28.87
35.00	0.2	1.5	1.6	0.2	2.83	0.05	0.18	0.50	2.92	65.00	22.22
33.00	0.2	1.6	1.6	0.2	3.63	0.05	0.18	0.49	3.72	65.00	17.48
33.00	0.2	1.6	1.6	0.2	3.63	0.05	0.06	0.23	3.69	65.00	17.61
30.00	0.2	1.6	1.6	0.3	4.24	0.05	0.06	0.21	4.29	65.00	15.15
27.50	0.2	1.6	1.6	0.4	4.67	0.05	0.06	0.19	4.73	65.00	13.75
25.00	0.2	1.6	1.6	0.4	5.05	0.05	0.06	0.17	5.10	65.00	12.75
22.50	0.2	1.6	1.6	0.4	5.36	0.05	0.06	0.15	5.41	65.00	12.01
20.00	0.2	1.6	1.7	0.5	5.61	0.05	0.06	0.13	5.66	65.00	11.48
17.50	0.2	1.6	1.6	0.4	5.36	0.05	0.06	0.15	5.41	65.00	12.01
15.00	0.2	1.6	1.6	0.4	5.05	0.05	0.06	0.17	5.10	65.00	12.75
12.50	0.2	1.6	1.6	0.4	4.67	0.05	0.06	0.19	4.72	65.00	13.76
10.00	0.2	1.6	1.6	0.3	4.23	0.05	0.06	0.21	4.29	65.00	15.16
7.00	0.2	1.6	1.6	0.2	3.63	0.05	0.06	0.23	3.69	65.00	17.63
7.00	0.2	1.6	1.6	0.2	3.63	0.05	0.18	0.49	3.72	65.00	17.50
5.00	0.2	1.5	1.6	0.2	2.83	0.05	0.18	0.50	2.92	65.00	22.25
2.50	0.2	1.5	1.5	0.1	2.02	0.05	0.18	0.52	2.24	65.00	29.00
0.00	0.2	1.5	1.5	0.0	1.55	0.05	0.18	0.54	1.85	65.00	35.11

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	607	2305	2383	471
60.00	138	-36	143	0	607	2309	2387	808
55.00	277	-73	286	0	608	2313	2391	1164
50.00	416	-109	430	0	608	2317	2395	1538
48.00	472	-124	488	0	608	2318	2397	1693
48.00	472	-124	488	0	608	2318	2396	1693
45.00	555	-146	574	0	609	2322	2401	2048
45.00	555	222	598	576	2759	11160	11496	183
40.00	1225	56	1227	576	2760	11167	11503	796
35.00	1896	-109	1899	576	2752	11174	11508	1454
32.00	2298	-208	2307	576	2752	11178	11512	1851
32.00	2085	-208	2095	480	2450	11212	11476	5929
30.00	2354	-266	2369	480	2450	11214	11479	6200
30.00	2354	-266	2369	480	2448	11214	11478	6763
25.00	3027	-413	3055	480	2445	11212	11475	7472
21.25	3531	-523	3570	480	2446	11215	11479	8013
21.25	3508	-523	3547	427	2396	11226	11479	10621
20.00	3677	-559	3719	427	2393	11218	11470	10816
15.00	4350	-702	4406	427	2389	11205	11457	11585
10.00	5022	-845	5093	427	2384	11189	11440	12382
5.00	5694	-988	5779	427	2379	11171	11421	13208
0.00	6364	-1131	6464	427	2379	11171	11422	14043

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	595	2308	2383	471
60.00	139	-36	143	0	596	2312	2387	808
55.00	277	-71	286	0	596	2316	2391	1164
50.00	416	-107	430	0	597	2320	2395	1538
48.00	472	-122	488	0	597	2321	2397	1693
48.00	472	-122	488	0	597	2321	2397	1693
45.00	556	-143	574	0	597	2325	2401	2048
45.00	555	120	568	-578	2046	11173	11358	2814
40.00	1226	-3	1226	-578	2052	11176	11363	3435
35.00	1897	-126	1901	-578	2056	11179	11366	4085
32.00	2299	-200	2308	-578	2057	11182	11370	4483
32.00	2086	-200	2095	-482	2370	11219	11466	8559
30.00	2355	-257	2369	-482	2371	11221	11469	8830
30.00	2355	-257	2369	-482	2373	11218	11466	9394
25.00	3028	-400	3055	-482	2375	11212	11460	10103
21.25	3533	-506	3569	-482	2376	11215	11464	10643
21.25	3510	-507	3546	-429	2429	11225	11485	13252
20.00	3678	-543	3718	-429	2429	11214	11474	13446
15.00	4351	-689	4405	-429	2429	11197	11457	14215
10.00	5023	-835	5092	-429	2427	11176	11437	15012
5.00	5694	-981	5777	-429	2425	11153	11413	15838
0.00	6363	-1126	6462	-429	2425	11153	11414	16673

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-576	368	683	0	1868	8837	9032	-2157
37.50	-311	310	439	0	2004	8834	9059	-2162
35.00	-46	247	252	0	2141	8832	9088	-2164
33.00	166	195	256	0	2251	8831	9114	-2164
33.00	166	195	256	0	1150	2948	3164	-943
30.00	272	150	311	0	1315	2946	3226	-943
27.50	361	109	377	0	1452	2945	3283	-942
25.00	449	63	454	0	1590	2944	3346	-941
22.50	537	14	538	0	1727	2943	3412	-939
20.00	626	-40	627	0	1865	2942	3483	-936
20.00	626	-40	627	0	765	-2945	3043	265
17.50	537	-65	541	0	902	-2947	3082	265
15.00	449	-94	459	0	1040	-2949	3127	262
12.50	360	-128	382	0	1178	-2950	3177	260
10.00	272	-165	318	0	1315	-2952	3232	258
7.00	166	-215	272	0	1480	-2954	3304	257
7.00	166	-215	272	0	379	-8846	8854	1436
5.00	-47	-226	231	0	488	-8847	8861	1437
2.50	-312	-243	395	0	625	-8848	8870	1442
0.00	-578	-263	635	0	763	-8850	8883	1442

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	95	0	95	214	-4072	34	4072	287
37.50	96	120	154	214	-3934	31	3934	289
35.00	97	236	255	214	-3797	28	3797	291
33.00	98	326	340	214	-3687	27	3687	291
33.00	98	326	340	71	-1707	11	1707	300
30.00	99	384	397	71	-1541	9	1541	302
27.50	99	428	440	71	-1403	8	1403	303
25.00	99	468	479	71	-1266	7	1266	305
22.50	99	504	514	71	-1128	6	1128	306
20.00	99	536	545	71	-990	5	990	306
20.00	99	536	545	-71	990	-9	990	306
17.50	99	504	514	-71	1128	-10	1128	306
15.00	99	468	479	-71	1266	-12	1266	305
12.50	98	428	440	-71	1403	-13	1403	303
10.00	98	384	397	-71	1541	-14	1541	302
7.00	98	326	340	-71	1707	-16	1707	300
7.00	97	326	340	-214	3687	-32	3687	291
5.00	96	236	255	-214	3797	-33	3797	291
2.50	95	120	153	-214	3934	-36	3935	289
0.00	94	0	94	-214	4072	-39	4072	287

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	53	0	53	23	-2601	16	2601	43
37.50	54	76	93	23	-2463	15	2463	44
35.00	54	148	157	23	-2326	14	2326	45
33.00	54	202	209	23	-2216	13	2216	45
33.00	54	202	209	8	-1216	7	1216	48
30.00	55	243	249	8	-1050	6	1050	49
27.50	55	273	278	8	-913	5	913	50
25.00	55	298	303	8	-775	4	775	50
22.50	55	319	324	8	-638	3	638	51
20.00	55	336	341	8	-500	2	500	51
20.00	55	336	341	-8	500	-4	500	51
17.50	55	319	324	-8	638	-5	638	51
15.00	55	298	303	-8	775	-6	775	50
12.50	55	273	278	-8	913	-7	913	50
10.00	54	243	249	-8	1050	-8	1050	49
7.00	54	202	209	-8	1216	-9	1216	48
7.00	54	202	209	-23	2216	-15	2216	45
5.00	54	148	157	-23	2326	-16	2326	45
2.50	53	76	93	-23	2463	-17	2463	44
0.00	53	0	53	-23	2601	-18	2601	43

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	6.4	6.5	0.0	0.00	0.03	0.00	0.28	0.48	65.00	99.90
60.00	0.8	5.7	5.7	0.0	1.38	0.04	0.00	0.26	1.42	65.00	45.71
55.00	0.7	4.9	5.0	0.0	2.48	0.06	0.00	0.25	2.54	65.00	25.55
50.00	0.6	4.2	4.2	0.0	3.38	0.08	0.00	0.24	3.45	65.00	18.84
48.00	0.6	3.9	3.9	0.0	3.68	0.08	0.00	0.23	3.76	65.00	17.27
48.00	0.6	3.9	3.9	0.0	2.49	0.05	0.00	0.16	2.54	65.00	25.54
45.00	0.5	3.5	3.5	0.0	2.77	0.06	0.00	0.15	2.83	65.00	22.94
45.00	0.5	3.5	3.5	0.0	2.87	0.01	1.35	2.08	4.33	65.00	15.02
40.00	0.5	2.8	2.9	0.0	5.28	0.02	1.24	1.93	5.92	65.00	10.98
35.00	0.4	2.2	2.2	0.0	7.50	0.04	1.13	1.80	7.80	65.00	8.33
32.00	0.3	1.9	1.9	0.0	8.72	0.05	1.08	1.73	8.98	65.00	7.24
32.00	0.3	1.9	1.9	0.0	7.93	0.17	0.90	1.55	8.26	65.00	7.87
30.00	0.3	1.7	1.7	0.0	8.70	0.17	0.87	1.51	9.00	65.00	7.22
30.00	0.3	1.7	1.7	0.0	8.70	0.19	0.87	1.51	9.02	65.00	7.21
25.00	0.2	1.2	1.2	0.0	10.38	0.20	0.80	1.41	10.68	65.00	6.09
21.25	0.1	0.8	0.9	0.0	11.47	0.21	0.76	1.35	11.75	65.00	5.53
21.25	0.1	0.8	0.9	0.0	11.39	0.27	0.67	1.27	11.73	65.00	5.54
20.00	0.1	0.8	0.8	0.0	11.72	0.27	0.66	1.25	12.06	65.00	5.39
15.00	0.1	0.4	0.4	0.0	12.91	0.28	0.61	1.18	13.24	65.00	4.91
10.00	0.0	0.2	0.2	0.0	13.90	0.29	0.57	1.12	14.23	65.00	4.57
5.00	0.0	0.0	0.0	0.0	14.72	0.30	0.53	1.06	15.06	65.00	4.32
0.00	0.0	0.0	0.0	0.0	15.41	0.31	0.50	1.01	15.75	65.00	4.13

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	6.4	6.5	0.0	0.00	0.03	0.00	0.28	0.48	65.00	99.90
60.00	0.8	5.7	5.7	0.0	1.38	0.04	0.00	0.26	1.42	65.00	45.71
55.00	0.7	4.9	5.0	0.0	2.48	0.06	0.00	0.25	2.54	65.00	25.55
50.00	0.6	4.2	4.2	0.0	3.38	0.08	0.00	0.24	3.45	65.00	18.84
48.00	0.6	3.9	3.9	0.0	3.68	0.08	0.00	0.23	3.76	65.00	17.27
48.00	0.6	3.9	3.9	0.0	2.49	0.05	0.00	0.16	2.54	65.00	25.54
45.00	0.5	3.5	3.5	0.0	2.77	0.06	0.00	0.15	2.83	65.00	22.94
45.00	0.5	3.5	3.5	0.0	2.74	0.09	1.36	2.07	4.14	65.00	15.70
40.00	0.4	2.8	2.9	0.0	5.22	0.10	1.24	1.93	5.94	65.00	10.93
35.00	0.4	2.2	2.2	0.0	7.53	0.12	1.14	1.79	7.87	65.00	8.26
32.00	0.3	1.9	1.9	0.0	8.72	0.12	1.08	1.72	9.03	65.00	7.20
32.00	0.3	1.9	1.9	0.0	7.93	0.24	0.90	1.55	8.31	65.00	7.82
30.00	0.3	1.7	1.7	0.0	8.69	0.24	0.87	1.51	9.05	65.00	7.18
30.00	0.3	1.7	1.7	0.0	8.69	0.26	0.87	1.51	9.07	65.00	7.17
25.00	0.2	1.2	1.2	0.0	10.38	0.27	0.81	1.42	10.73	65.00	6.06
21.25	0.1	0.8	0.9	0.0	11.46	0.27	0.76	1.35	11.80	65.00	5.51
21.25	0.1	0.8	0.9	0.0	11.38	0.34	0.68	1.27	11.78	65.00	5.52
20.00	0.1	0.8	0.8	0.0	11.72	0.34	0.67	1.25	12.11	65.00	5.37
15.00	0.1	0.4	0.4	0.0	12.90	0.35	0.62	1.18	13.29	65.00	4.89
10.00	0.0	0.2	0.2	0.0	13.89	0.35	0.58	1.12	14.28	65.00	4.55
5.00	0.0	0.0	0.0	0.0	14.72	0.36	0.54	1.06	15.11	65.00	4.30
0.00	0.0	0.0	0.0	0.0	15.40	0.37	0.50	1.01	15.79	65.00	4.12

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	3.5	3.5	0.0	10.70	0.15	0.00	1.26	10.86	65.00	5.99
37.50	0.5	3.6	3.6	0.1	6.45	0.15	0.00	1.27	6.83	65.00	9.52
35.00	0.5	3.7	3.7	0.1	3.92	0.15	0.00	1.27	4.43	65.00	14.67
33.00	0.5	3.8	3.8	0.1	3.88	0.15	0.00	1.27	4.57	65.00	14.22
33.00	0.5	3.8	3.8	0.1	3.88	0.06	0.00	0.44	4.01	65.00	16.20
30.00	0.5	3.9	3.9	0.1	4.92	0.06	0.00	0.45	5.02	65.00	12.96
27.50	0.5	4.0	4.0	0.1	5.97	0.06	0.00	0.46	6.06	65.00	10.73
25.00	0.5	4.0	4.1	0.0	6.99	0.06	0.00	0.47	7.08	65.00	9.18
22.50	0.5	4.1	4.1	0.0	7.98	0.06	0.00	0.48	8.07	65.00	8.05
20.00	0.5	4.1	4.1	0.0	9.44	0.06	0.00	0.49	9.51	65.00	6.84
20.00	0.5	4.1	4.1	0.0	9.44	0.02	0.00	0.43	9.47	65.00	6.86
17.50	0.5	4.1	4.1	0.0	8.30	0.02	0.00	0.43	8.33	65.00	7.80
15.00	0.5	4.0	4.1	0.0	7.17	0.02	0.00	0.44	7.21	65.00	9.01
12.50	0.5	4.0	4.0	0.0	6.08	0.02	0.00	0.45	6.12	65.00	10.62
10.00	0.5	3.9	3.9	-0.1	5.00	0.02	0.00	0.45	5.05	65.00	12.86
7.00	0.5	3.8	3.8	-0.1	4.18	0.02	0.00	0.46	4.27	65.00	15.23
7.00	0.5	3.8	3.8	-0.1	4.18	0.10	0.00	1.24	4.72	65.00	13.76
5.00	0.5	3.7	3.7	0.0	3.60	0.10	0.00	1.24	4.18	65.00	15.57
2.50	0.5	3.6	3.6	0.0	6.07	0.10	0.00	1.24	6.20	65.00	10.48
0.00	0.5	3.5	3.5	0.0	10.09	0.10	0.00	1.24	10.21	65.00	6.36

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.9	1.9	0.0	1.40	0.02	1.64	2.21	4.08	65.00	15.95
37.50	0.3	1.9	1.9	0.1	2.35	0.02	1.64	2.19	4.30	65.00	15.13
35.00	0.3	1.9	2.0	0.3	4.06	0.02	1.64	2.17	5.17	65.00	12.56
33.00	0.3	2.0	2.0	0.4	5.39	0.02	1.64	2.15	6.27	65.00	10.37
33.00	0.3	2.0	2.0	0.4	5.39	0.02	0.55	0.78	5.52	65.00	11.78
30.00	0.3	2.0	2.0	0.5	6.25	0.02	0.55	0.76	6.36	65.00	10.22
27.50	0.3	2.0	2.0	0.6	6.90	0.02	0.55	0.74	7.00	65.00	9.28
25.00	0.3	2.0	2.0	0.7	7.49	0.02	0.55	0.72	7.58	65.00	8.57
22.50	0.3	2.0	2.0	0.7	8.02	0.02	0.55	0.70	8.11	65.00	8.02
20.00	0.3	2.0	2.0	0.7	8.49	0.02	0.55	0.68	8.57	65.00	7.58
20.00	0.3	2.0	2.0	0.7	8.49	0.02	0.55	0.69	8.57	65.00	7.58
17.50	0.3	2.0	2.0	0.7	8.02	0.02	0.55	0.70	8.11	65.00	8.02
15.00	0.3	2.0	2.0	0.7	7.49	0.02	0.55	0.72	7.58	65.00	8.57
12.50	0.3	2.0	2.0	0.6	6.90	0.02	0.55	0.74	7.00	65.00	9.29
10.00	0.3	2.0	2.0	0.5	6.25	0.02	0.55	0.76	6.36	65.00	10.22
7.00	0.3	2.0	2.0	0.4	5.38	0.02	0.55	0.79	5.51	65.00	11.79
7.00	0.3	2.0	2.0	0.4	5.38	0.02	1.64	2.15	6.26	65.00	10.38
5.00	0.3	1.9	2.0	0.3	4.06	0.02	1.64	2.17	5.17	65.00	12.57
2.50	0.3	1.9	1.9	0.1	2.35	0.02	1.64	2.19	4.29	65.00	15.15
0.00	0.3	1.9	1.9	0.0	1.38	0.02	1.64	2.21	4.07	65.00	15.96

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.8	0.9	0.0	0.78	0.00	0.18	0.54	1.22	65.00	53.17
37.50	0.1	0.9	0.9	0.1	1.44	0.00	0.18	0.52	1.54	65.00	42.18
35.00	0.1	0.9	0.9	0.2	2.50	0.00	0.18	0.50	2.56	65.00	25.41
33.00	0.1	0.9	0.9	0.2	3.30	0.00	0.18	0.49	3.35	65.00	19.42
33.00	0.1	0.9	0.9	0.2	3.31	0.00	0.06	0.23	3.32	65.00	19.61
30.00	0.1	0.9	0.9	0.3	3.91	0.00	0.06	0.21	3.91	65.00	16.61
27.50	0.1	0.9	0.9	0.4	4.34	0.00	0.06	0.19	4.35	65.00	14.95
25.00	0.1	0.9	0.9	0.4	4.71	0.00	0.06	0.17	4.72	65.00	13.77
22.50	0.1	0.9	0.9	0.4	5.02	0.00	0.06	0.15	5.03	65.00	12.92
20.00	0.1	0.9	0.9	0.4	5.28	0.00	0.06	0.13	5.28	65.00	12.31
17.50	0.1	0.9	0.9	0.4	5.02	0.00	0.06	0.15	5.03	65.00	12.92
15.00	0.1	0.9	0.9	0.4	4.71	0.00	0.06	0.17	4.72	65.00	13.78
12.50	0.1	0.9	0.9	0.4	4.34	0.00	0.06	0.19	4.35	65.00	14.96
10.00	0.1	0.9	0.9	0.3	3.90	0.00	0.06	0.21	3.91	65.00	16.61
7.00	0.1	0.9	0.9	0.2	3.30	0.00	0.06	0.23	3.31	65.00	19.62
7.00	0.1	0.9	0.9	0.2	3.30	0.00	0.18	0.49	3.35	65.00	19.43
5.00	0.1	0.9	0.9	0.2	2.50	0.00	0.18	0.50	2.56	65.00	25.43
2.50	0.1	0.9	0.9	0.1	1.44	0.00	0.18	0.52	1.54	65.00	42.23
0.00	0.1	0.8	0.9	0.0	0.78	0.00	0.18	0.54	1.22	65.00	53.32

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	739	2529	2635	1522
60.00	152	-47	159	0	796	2535	2657	1829
55.00	304	-97	319	0	855	2540	2680	2153
50.00	457	-150	481	0	917	2546	2706	2493
48.00	518	-172	546	0	943	2549	2717	2634
48.00	518	-172	546	0	942	2548	2717	2634
45.00	610	-207	644	0	982	2554	2736	2957
45.00	612	-336	698	1167	-950	20428	20450	8914
40.00	1838	-280	1859	1167	-902	20427	20446	9494
35.00	3064	-228	3072	1167	-845	20424	20441	10102
32.00	3799	-198	3804	1167	-800	20429	20445	10463
32.00	3627	-198	3633	970	5114	20412	21043	13869
30.00	4117	-321	4130	970	5144	20416	21054	14115
30.00	4117	-322	4130	970	5260	20403	21071	14586
25.00	5342	-640	5380	970	5325	20385	21069	15260
21.25	6259	-881	6321	970	5385	20391	21090	15752
21.25	6240	-880	6302	862	4837	20391	20957	18082
20.00	6546	-953	6615	862	4848	20365	20934	18283
15.00	7768	-1245	7867	862	4916	20323	20909	19022
10.00	8988	-1542	9119	862	4986	20275	20879	19789
5.00	10205	-1843	10370	862	5058	20221	20844	20583
0.00	11418	-2150	11619	862	5150	20222	20868	21342

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	712	2536	2634	1523
60.00	152	-46	159	0	768	2543	2656	1829
55.00	305	-94	319	0	827	2549	2680	2153
50.00	458	-145	481	0	889	2555	2705	2494
48.00	520	-167	546	0	915	2558	2717	2634
48.00	520	-167	546	0	914	2557	2716	2635
45.00	612	-200	644	0	954	2564	2736	2957
45.00	610	1015	1184	-1169	8984	20456	22342	13423
40.00	1838	474	1898	-1169	9076	20443	22367	14000
35.00	3065	-74	3066	-1169	9162	20429	22389	14608
32.00	3800	-404	3822	-1169	9206	20435	22413	14970
32.00	3628	-405	3650	-975	3551	20504	20809	18404
30.00	4120	-490	4149	-975	3581	20508	20818	18650
30.00	4120	-492	4149	-975	3712	20486	20819	19121
25.00	5349	-718	5397	-975	3795	20454	20803	19795
21.25	6270	-890	6333	-975	3855	20460	20820	20287
21.25	6249	-891	6313	-868	4618	20471	20985	22601
20.00	6556	-960	6626	-868	4638	20435	20955	22802
15.00	7783	-1242	7881	-868	4720	20377	20917	23541
10.00	9005	-1528	9134	-868	4802	20313	20873	24309
5.00	10224	-1820	10385	-868	4884	20244	20825	25103
0.00	11439	-2116	11633	-868	4976	20245	20848	25862

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1167	-128	1174	-2	-5948	17880	18843	1907
37.50	-630	48	632	-2	-5824	17877	18802	1908
35.00	-94	221	240	-2	-5698	17878	18764	1887
33.00	335	357	489	-2	-5598	17876	18732	1887
33.00	335	357	490	-2	-795	5992	6044	4007
30.00	551	383	671	-2	-642	5985	6019	4013
27.50	730	401	838	-2	-514	5978	6000	4021
25.00	909	414	999	-2	-386	5969	5982	4031
22.50	1088	424	1168	-2	-258	5959	5965	4042
20.00	1267	430	1338	-2	-133	5957	5959	4042
20.00	1267	430	1338	-2	4678	-5950	7569	6053
17.50	1089	288	1126	-2	4804	-5952	7649	6053
15.00	910	142	921	-2	4932	-5966	7740	6040
12.50	730	-8	731	-2	5058	-5978	7831	6029
10.00	551	-161	574	-2	5183	-5988	7920	6021
7.00	335	-351	485	-2	5331	-5997	8024	6017
7.00	335	-350	484	-2	10136	-17911	20580	7944
5.00	-95	-594	602	-2	10228	-17912	20626	7958
2.50	-632	-903	1102	-2	10341	-17906	20678	7993
0.00	-1169	-1215	1687	-2	10466	-17909	20743	7993

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	196	0	196	172	-3378	-6	3378	-5927
37.50	196	100	220	172	-3254	-8	3254	-5926
35.00	196	195	277	172	-3131	-9	3131	-5925
33.00	196	269	333	172	-3031	-10	3031	-5925
33.00	202	269	337	57	-1434	-33	1435	-5837
30.00	201	318	376	57	-1284	-35	1285	-5837
27.50	200	355	407	57	-1163	-35	1163	-5836
25.00	199	388	436	57	-1041	-35	1042	-5835
22.50	198	417	462	57	-920	-35	920	-5834
20.00	197	443	485	57	-799	-35	800	-5833
20.00	203	443	487	-59	797	-57	799	-5752
17.50	202	417	463	-59	918	-57	920	-5753
15.00	200	388	436	-59	1039	-57	1041	-5753
12.50	198	355	406	-59	1161	-57	1162	-5754
10.00	197	318	374	-59	1283	-57	1284	-5755
7.00	194	269	332	-59	1433	-59	1434	-5756
7.00	200	269	336	-174	3030	-82	3031	-5681
5.00	198	195	278	-174	3130	-84	3132	-5681
2.50	196	99	220	-174	3254	-85	3255	-5682
0.00	193	0	193	-174	3378	-87	3379	-5683

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	108	0	108	19	-2305	19	2305	539
37.50	109	67	128	19	-2180	17	2180	539
35.00	109	131	170	19	-2055	15	2055	540
33.00	109	179	210	19	-1955	14	1955	540
33.00	111	178	209	6	-1091	4	1091	613
30.00	111	214	241	6	-940	2	940	614
27.50	111	241	265	6	-815	1	815	615
25.00	111	263	286	6	-690	-1	690	615
22.50	111	282	303	6	-564	-2	564	615
20.00	111	297	317	6	-439	-4	439	615
20.00	112	296	316	-7	425	-14	425	686
17.50	111	281	303	-7	550	-15	550	686
15.00	111	263	285	-7	675	-17	676	686
12.50	110	241	265	-7	801	-18	801	685
10.00	110	215	241	-7	926	-20	927	685
7.00	109	179	209	-7	1077	-22	1077	684
7.00	110	178	209	-21	1941	-32	1941	753
5.00	109	130	170	-21	2041	-33	2042	752
2.50	108	67	127	-21	2167	-35	2167	752
0.00	107	0	107	-21	2292	-36	2292	751

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.7	11.1	11.3	0.1	0.01	0.09	0.00	0.30	0.54	65.00	99.90
60.00	1.5	9.9	10.0	0.1	1.53	0.10	0.00	0.29	1.63	65.00	39.87
55.00	1.3	8.6	8.7	0.1	2.77	0.11	0.00	0.28	2.88	65.00	22.60
50.00	1.1	7.4	7.5	0.1	3.77	0.12	0.00	0.27	3.89	65.00	16.71
48.00	1.1	6.9	7.0	0.1	4.11	0.13	0.00	0.26	4.24	65.00	15.32
48.00	1.1	6.9	7.0	0.1	2.78	0.08	0.00	0.18	2.87	65.00	22.66
45.00	1.0	6.2	6.3	0.1	3.10	0.09	0.00	0.17	3.19	65.00	20.35
45.00	1.0	6.2	6.3	0.1	3.27	0.28	2.75	4.04	7.41	65.00	8.77
40.00	0.8	5.0	5.1	0.0	8.14	0.28	2.51	3.74	9.79	65.00	6.64
35.00	0.6	3.9	4.0	0.0	12.18	0.29	2.30	3.48	13.29	65.00	4.89
32.00	0.6	3.3	3.4	0.0	14.28	0.29	2.19	3.34	15.22	65.00	4.27
32.00	0.6	3.3	3.4	0.0	13.64	0.39	1.82	3.00	14.39	65.00	4.52
30.00	0.5	3.0	3.0	0.0	15.08	0.39	1.76	2.93	15.77	65.00	4.12
30.00	0.5	3.0	3.0	0.0	15.08	0.40	1.76	2.93	15.78	65.00	4.12
25.00	0.4	2.1	2.1	0.0	18.25	0.40	1.62	2.75	18.86	65.00	3.45
21.25	0.3	1.5	1.5	0.0	20.28	0.40	1.53	2.63	20.86	65.00	3.12
21.25	0.3	1.5	1.5	0.0	20.22	0.46	1.36	2.45	20.83	65.00	3.12
20.00	0.2	1.4	1.4	0.0	20.84	0.46	1.34	2.41	21.44	65.00	3.03
15.00	0.1	0.8	0.8	0.0	23.05	0.46	1.24	2.27	23.62	65.00	2.75
10.00	0.1	0.3	0.4	0.0	24.90	0.47	1.16	2.15	25.44	65.00	2.55
5.00	0.0	0.1	0.1	0.0	26.44	0.47	1.08	2.04	26.97	65.00	2.41
0.00	0.0	0.0	0.0	0.0	27.72	0.47	1.01	1.94	28.25	65.00	2.30

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.5	11.1	11.2	0.1	0.01	0.09	0.00	0.30	0.54	65.00	99.90
60.00	1.4	9.9	10.0	0.1	1.53	0.10	0.00	0.29	1.63	65.00	39.86
55.00	1.2	8.6	8.7	0.1	2.77	0.11	0.00	0.28	2.88	65.00	22.60
50.00	1.1	7.4	7.5	0.1	3.77	0.12	0.00	0.27	3.89	65.00	16.70
48.00	1.0	6.9	7.0	0.1	4.12	0.13	0.00	0.26	4.24	65.00	15.32
48.00	1.0	6.9	7.0	0.1	2.78	0.08	0.00	0.18	2.87	65.00	22.66
45.00	1.0	6.2	6.3	0.1	3.10	0.09	0.00	0.17	3.19	65.00	20.35
45.00	1.0	6.2	6.3	0.1	5.55	0.42	2.75	4.16	9.33	65.00	6.97
40.00	0.8	5.0	5.1	0.0	8.36	0.42	2.51	3.86	10.53	65.00	6.17
35.00	0.7	4.0	4.0	0.0	12.03	0.42	2.30	3.59	13.43	65.00	4.84
32.00	0.6	3.3	3.4	0.0	14.49	0.42	2.19	3.45	15.47	65.00	4.20
32.00	0.6	3.3	3.4	0.0	13.85	0.51	1.83	3.00	14.67	65.00	4.43
30.00	0.5	3.0	3.0	0.0	15.25	0.51	1.77	2.92	16.02	65.00	4.06
30.00	0.5	3.0	3.0	0.0	15.25	0.52	1.77	2.92	16.04	65.00	4.05
25.00	0.4	2.1	2.1	0.0	18.34	0.52	1.63	2.74	19.05	65.00	3.41
21.25	0.3	1.5	1.5	0.0	20.33	0.52	1.54	2.62	21.00	65.00	3.10
21.25	0.3	1.5	1.5	0.0	20.26	0.58	1.37	2.46	20.97	65.00	3.10
20.00	0.2	1.4	1.4	0.0	20.88	0.58	1.35	2.42	21.58	65.00	3.01
15.00	0.1	0.8	0.8	0.0	23.09	0.58	1.25	2.28	23.75	65.00	2.74
10.00	0.1	0.3	0.4	0.0	24.93	0.57	1.16	2.16	25.58	65.00	2.54
5.00	0.0	0.1	0.1	0.0	26.47	0.57	1.09	2.05	27.10	65.00	2.40
0.00	0.0	0.0	0.0	0.0	27.75	0.57	1.02	1.95	28.37	65.00	2.29

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.0	6.2	6.3	0.1	17.93	0.13	0.01	2.63	18.06	65.00	3.60
37.50	1.0	6.4	6.4	0.1	9.56	0.13	0.01	2.62	10.14	65.00	6.41
35.00	1.0	6.6	6.6	0.2	3.82	0.13	0.01	2.62	6.01	65.00	10.81
33.00	1.0	6.7	6.8	0.3	7.28	0.13	0.01	2.61	8.19	65.00	7.94
33.00	1.0	6.7	6.8	0.3	7.29	0.27	0.01	0.86	7.67	65.00	8.47
30.00	1.0	7.0	7.1	0.4	10.43	0.27	0.01	0.85	10.71	65.00	6.07
27.50	1.0	7.2	7.2	0.4	13.17	0.27	0.01	0.85	13.45	65.00	4.83
25.00	1.0	7.3	7.4	0.4	15.89	0.27	0.01	0.85	16.17	65.00	4.02
22.50	1.0	7.4	7.4	0.4	18.58	0.27	0.01	0.85	18.86	65.00	3.45
20.00	1.0	7.4	7.5	0.4	21.24	0.27	0.01	0.85	21.53	65.00	3.02
20.00	1.0	7.4	7.5	0.4	21.25	0.41	0.01	1.07	21.67	65.00	3.00
17.50	1.0	7.4	7.4	0.4	17.76	0.41	0.01	1.08	18.18	65.00	3.58
15.00	1.0	7.3	7.4	0.3	14.24	0.41	0.01	1.09	14.66	65.00	4.43
12.50	1.0	7.2	7.2	0.2	10.79	0.41	0.01	1.10	11.32	65.00	5.74
10.00	1.0	7.0	7.1	0.2	9.08	0.41	0.01	1.12	9.65	65.00	6.74
7.00	1.0	6.8	6.8	0.1	7.19	0.41	0.01	1.13	7.83	65.00	8.31
7.00	1.0	6.8	6.8	0.1	7.18	0.54	0.01	2.88	9.17	65.00	7.08
5.00	1.0	6.6	6.7	0.0	9.32	0.54	0.01	2.88	10.32	65.00	6.30
2.50	1.0	6.4	6.5	0.0	17.13	0.54	0.01	2.89	17.93	65.00	3.62
0.00	1.0	6.2	6.3	0.1	24.98	0.54	0.01	2.90	25.71	65.00	2.53

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	3.3	3.4	0.0	2.89	0.40	1.32	1.79	3.97	65.00	16.37
37.50	0.6	3.4	3.5	0.1	3.49	0.40	1.32	1.77	4.31	65.00	15.08
35.00	0.6	3.5	3.5	0.3	4.07	0.40	1.32	1.75	4.89	65.00	13.29
33.00	0.6	3.5	3.6	0.3	5.15	0.40	1.32	1.74	5.90	65.00	11.02
33.00	0.6	3.5	3.6	0.3	5.19	0.40	0.43	0.63	5.62	65.00	11.57
30.00	0.6	3.6	3.6	0.4	5.90	0.40	0.43	0.61	6.33	65.00	10.28
27.50	0.6	3.6	3.7	0.5	6.43	0.40	0.43	0.60	6.86	65.00	9.48
25.00	0.6	3.6	3.7	0.6	6.91	0.40	0.43	0.58	7.34	65.00	8.86
22.50	0.6	3.6	3.7	0.6	7.34	0.40	0.43	0.56	7.76	65.00	8.37
20.00	0.6	3.7	3.7	0.6	7.71	0.40	0.43	0.55	8.14	65.00	7.99
20.00	0.6	3.7	3.7	0.6	7.75	0.39	0.45	0.56	8.17	65.00	7.95
17.50	0.6	3.6	3.7	0.6	7.36	0.39	0.45	0.58	7.78	65.00	8.35
15.00	0.6	3.6	3.7	0.6	6.92	0.39	0.45	0.59	7.34	65.00	8.85
12.50	0.6	3.6	3.7	0.5	6.42	0.39	0.45	0.61	6.85	65.00	9.49
10.00	0.6	3.6	3.6	0.4	5.87	0.39	0.45	0.63	6.30	65.00	10.32
7.00	0.6	3.5	3.6	0.3	5.14	0.39	0.45	0.65	5.57	65.00	11.67
7.00	0.6	3.5	3.6	0.3	5.18	0.39	1.33	1.75	5.93	65.00	10.97
5.00	0.6	3.5	3.5	0.3	4.11	0.39	1.33	1.77	4.91	65.00	13.25
2.50	0.6	3.4	3.5	0.1	3.49	0.39	1.33	1.79	4.33	65.00	15.01
0.00	0.6	3.3	3.4	0.0	2.84	0.39	1.33	1.80	3.97	65.00	16.36

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.5	1.5	0.0	1.59	0.04	0.15	0.47	1.82	65.00	35.74
37.50	0.3	1.6	1.6	0.1	2.01	0.04	0.15	0.45	2.17	65.00	29.90
35.00	0.3	1.6	1.6	0.2	2.59	0.04	0.15	0.44	2.66	65.00	24.43
33.00	0.3	1.6	1.6	0.2	3.30	0.04	0.15	0.42	3.36	65.00	19.34
33.00	0.3	1.6	1.6	0.2	3.29	0.04	0.05	0.20	3.33	65.00	19.50
30.00	0.3	1.7	1.7	0.3	3.82	0.04	0.05	0.18	3.87	65.00	16.79
27.50	0.3	1.7	1.7	0.3	4.21	0.04	0.05	0.16	4.26	65.00	15.27
25.00	0.3	1.7	1.7	0.4	4.54	0.04	0.05	0.14	4.59	65.00	14.17
22.50	0.3	1.7	1.7	0.4	4.82	0.04	0.05	0.12	4.86	65.00	13.36
20.00	0.3	1.7	1.7	0.4	5.04	0.04	0.05	0.11	5.08	65.00	12.78
20.00	0.3	1.7	1.7	0.4	5.03	0.05	0.06	0.12	5.08	65.00	12.79
17.50	0.3	1.7	1.7	0.4	4.81	0.05	0.06	0.13	4.86	65.00	13.37
15.00	0.3	1.7	1.7	0.4	4.54	0.05	0.06	0.15	4.59	65.00	14.16
12.50	0.3	1.7	1.7	0.3	4.21	0.05	0.06	0.17	4.26	65.00	15.25
10.00	0.3	1.7	1.7	0.3	3.83	0.05	0.06	0.19	3.88	65.00	16.76
7.00	0.3	1.6	1.6	0.2	3.29	0.05	0.06	0.21	3.35	65.00	19.43
7.00	0.3	1.6	1.6	0.2	3.28	0.05	0.16	0.43	3.36	65.00	19.32
5.00	0.3	1.6	1.6	0.2	2.58	0.05	0.16	0.44	2.67	65.00	24.37
2.50	0.3	1.6	1.6	0.1	2.00	0.05	0.16	0.46	2.18	65.00	29.76
0.00	0.3	1.5	1.5	0.0	1.58	0.05	0.16	0.48	1.83	65.00	35.60

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	718	2552	2651	1520
60.00	156	-43	162	0	719	2614	2711	1826
55.00	315	-86	327	0	720	2678	2773	2150
50.00	478	-129	495	0	721	2746	2839	2491
48.00	544	-147	563	0	721	2774	2866	2631
48.00	544	-147	563	0	721	2773	2866	2632
45.00	645	-173	667	0	722	2819	2910	2954
45.00	647	-379	750	1178	-1222	20971	21006	9225
40.00	1908	-306	1932	1178	-1242	21037	21073	9807
35.00	3172	-231	3181	1178	-1256	21104	21141	10417
32.00	3933	-185	3937	1178	-1255	21154	21191	10778
32.00	3761	-185	3765	997	4513	21473	21942	14182
30.00	4277	-293	4287	997	4514	21507	21976	14428
30.00	4279	-293	4289	997	4504	21619	22083	14901
25.00	5578	-563	5607	997	4492	21675	22136	15579
21.25	6555	-765	6600	997	4493	21741	22200	16070
21.25	6534	-764	6578	907	3842	22047	22379	18393
20.00	6865	-822	6914	907	3832	22039	22370	18598
15.00	8190	-1051	8257	907	3817	22076	22403	19344
10.00	9517	-1279	9603	907	3802	22109	22434	20119
5.00	10847	-1507	10951	907	3787	22139	22461	20922
0.00	12178	-1734	12301	907	3787	22232	22552	21681

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	690	2559	2651	1520
60.00	157	-41	162	0	690	2621	2710	1827
55.00	316	-83	327	0	690	2685	2773	2151
50.00	479	-124	495	0	690	2753	2838	2491
48.00	546	-141	563	0	690	2781	2866	2632
48.00	546	-141	563	0	690	2781	2865	2632
45.00	646	-166	667	0	690	2826	2909	2955
45.00	646	968	1164	-1183	8670	21006	22725	13063
40.00	1909	447	1961	-1183	8694	21061	22785	13642
35.00	3175	-75	3176	-1183	8710	21118	22843	14252
32.00	3936	-389	3956	-1183	8711	21168	22890	14613
32.00	3764	-389	3784	-1004	2954	21494	21696	18042
30.00	4281	-460	4305	-1004	2955	21528	21729	18288
30.00	4282	-460	4307	-1004	2962	21630	21832	18761
25.00	5583	-639	5619	-1004	2969	21675	21877	19439
21.25	6560	-772	6605	-1004	2969	21741	21943	19930
21.25	6538	-773	6584	-916	3623	22045	22341	22250
20.00	6869	-827	6918	-916	3624	22029	22325	22455
15.00	8193	-1046	8260	-916	3626	22052	22348	23202
10.00	9519	-1264	9602	-916	3625	22071	22367	23977
5.00	10846	-1482	10947	-916	3623	22087	22382	24779
0.00	12174	-1700	12292	-916	3623	22180	22474	25538

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1178	-206	1196	-2	-6262	18158	19208	1918
37.50	-634	-20	634	-2	-6138	18125	19136	1918
35.00	-90	162	185	-2	-6013	18094	19067	1896
33.00	344	305	459	-2	-5913	18067	19010	1897
33.00	343	305	459	-2	-1123	6160	6261	3999
30.00	565	343	660	-2	-971	6116	6192	4006
27.50	747	370	834	-2	-844	6077	6135	4014
25.00	929	393	1009	-2	-717	6037	6080	4024
22.50	1110	413	1184	-2	-590	5996	6025	4036
20.00	1289	429	1359	-2	-465	5963	5981	4036
20.00	1289	429	1359	-1	4334	-5967	7375	6030
17.50	1110	297	1149	-1	4458	-6001	7476	6030
15.00	929	161	943	-1	4585	-6046	7588	6016
12.50	747	22	747	-1	4711	-6088	7698	6005
10.00	563	-121	576	-1	4836	-6129	7807	5997
7.00	342	-298	454	-1	4984	-6176	7936	5991
7.00	342	-298	454	0	9777	-18113	20584	7897
5.00	-93	-534	542	0	9870	-18138	20650	7909
2.50	-638	-832	1048	0	9983	-18163	20726	7943
0.00	-1183	-1133	1638	0	10107	-18196	20815	7943

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	181	0	181	172	-3373	331	3390	-5783
37.50	190	99	215	172	-3250	299	3264	-5782
35.00	199	195	279	172	-3127	267	3138	-5781
33.00	205	269	338	172	-3027	240	3037	-5780
33.00	205	269	338	57	-1431	183	1442	-5774
30.00	211	317	381	57	-1285	146	1293	-5773
27.50	215	354	414	57	-1160	113	1166	-5773
25.00	218	387	444	57	-1039	83	1042	-5772
22.50	220	417	471	57	-918	52	920	-5771
20.00	221	442	495	57	-798	21	798	-5770
20.00	221	442	495	-58	798	-34	798	-5770
17.50	220	417	471	-58	918	-65	920	-5771
15.00	217	387	444	-58	1039	-96	1043	-5772
12.50	214	354	414	-58	1160	-126	1167	-5773
10.00	210	317	380	-58	1285	-159	1294	-5773
7.00	203	269	337	-58	1431	-197	1444	-5774
7.00	203	269	337	-173	3027	-253	3038	-5780
5.00	197	195	277	-173	3127	-280	3139	-5781
2.50	188	99	212	-173	3250	-312	3265	-5782
0.00	178	0	178	-173	3373	-344	3391	-5783

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	90	0	90	22	-2295	326	2318	641
37.50	99	67	120	22	-2170	293	2190	642
35.00	108	130	169	22	-2045	261	2062	642
33.00	113	178	211	22	-1945	235	1959	643
33.00	113	178	211	7	-1082	189	1098	645
30.00	120	214	245	7	-932	150	944	646
27.50	124	240	270	7	-807	118	815	646
25.00	127	263	292	7	-682	85	687	647
22.50	129	281	309	7	-557	53	559	647
20.00	130	296	323	7	-432	20	432	647
20.00	130	296	323	-7	432	-26	433	647
17.50	129	281	309	-7	557	-58	560	647
15.00	126	263	292	-7	682	-90	688	647
12.50	123	240	270	-7	807	-123	816	646
10.00	119	214	245	-7	932	-155	945	646
7.00	113	178	211	-7	1082	-194	1099	645
7.00	113	178	211	-22	1945	-240	1960	643
5.00	107	130	168	-22	2045	-266	2062	642
2.50	98	67	119	-22	2170	-299	2190	642
0.00	89	0	89	-22	2295	-331	2318	641

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.5	11.7	11.8	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.3	10.4	10.5	0.1	1.56	0.10	0.00	0.30	1.66	65.00	39.16
55.00	1.1	9.1	9.1	0.1	2.83	0.11	0.00	0.29	2.94	65.00	22.09
50.00	1.0	7.8	7.8	0.1	3.89	0.12	0.00	0.28	4.01	65.00	16.22
48.00	0.9	7.3	7.3	0.1	4.26	0.13	0.00	0.28	4.38	65.00	14.83
48.00	0.9	7.3	7.3	0.1	2.88	0.08	0.00	0.19	2.96	65.00	21.94
45.00	0.8	6.5	6.6	0.1	3.22	0.09	0.00	0.18	3.31	65.00	19.62
45.00	0.8	6.5	6.6	0.1	3.50	0.29	2.77	4.10	7.62	65.00	8.53
40.00	0.7	5.3	5.4	0.0	8.47	0.29	2.53	3.80	10.13	65.00	6.42
35.00	0.5	4.2	4.2	0.0	12.61	0.30	2.32	3.54	13.73	65.00	4.73
32.00	0.5	3.5	3.6	0.0	14.76	0.30	2.21	3.40	15.72	65.00	4.14
32.00	0.5	3.5	3.6	0.0	14.13	0.40	1.87	3.10	14.90	65.00	4.36
30.00	0.4	3.1	3.2	0.0	15.62	0.40	1.81	3.02	16.34	65.00	3.98
30.00	0.4	3.1	3.2	0.0	15.63	0.41	1.81	3.03	16.36	65.00	3.97
25.00	0.3	2.2	2.2	0.0	18.96	0.41	1.67	2.85	19.61	65.00	3.32
21.25	0.2	1.6	1.6	0.0	21.11	0.41	1.58	2.72	21.71	65.00	2.99
21.25	0.2	1.6	1.6	0.0	21.04	0.47	1.43	2.59	21.68	65.00	3.00
20.00	0.2	1.4	1.4	0.0	21.71	0.47	1.41	2.55	22.33	65.00	2.91
15.00	0.1	0.8	0.8	0.0	24.10	0.47	1.31	2.41	24.69	65.00	2.63
10.00	0.1	0.4	0.4	0.0	26.11	0.47	1.22	2.28	26.68	65.00	2.44
5.00	0.0	0.1	0.1	0.0	27.80	0.48	1.14	2.17	28.36	65.00	2.29
0.00	0.0	0.0	0.0	0.0	29.22	0.48	1.06	2.06	29.77	65.00	2.18

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	11.7	11.8	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.1	10.4	10.5	0.1	1.56	0.10	0.00	0.30	1.66	65.00	39.16
55.00	1.0	9.1	9.1	0.1	2.83	0.11	0.00	0.29	2.94	65.00	22.09
50.00	0.9	7.8	7.8	0.1	3.88	0.12	0.00	0.28	4.01	65.00	16.22
48.00	0.9	7.3	7.3	0.1	4.25	0.13	0.00	0.28	4.38	65.00	14.84
48.00	0.9	7.3	7.3	0.1	2.88	0.08	0.00	0.19	2.96	65.00	21.94
45.00	0.8	6.5	6.6	0.1	3.22	0.09	0.00	0.18	3.31	65.00	19.62
45.00	0.8	6.5	6.6	0.1	5.51	0.41	2.78	4.21	9.33	65.00	6.97
40.00	0.7	5.3	5.4	0.0	8.63	0.41	2.54	3.91	10.77	65.00	6.04
35.00	0.5	4.2	4.2	0.0	12.46	0.41	2.33	3.64	13.82	65.00	4.70
32.00	0.5	3.5	3.6	0.0	14.98	0.41	2.22	3.50	15.93	65.00	4.08
32.00	0.5	3.5	3.6	0.0	14.34	0.50	1.88	3.10	15.14	65.00	4.29
30.00	0.4	3.1	3.2	0.0	15.79	0.50	1.82	3.02	16.55	65.00	3.93
30.00	0.4	3.1	3.2	0.0	15.80	0.51	1.82	3.02	16.57	65.00	3.92
25.00	0.3	2.2	2.2	0.0	19.04	0.51	1.68	2.84	19.74	65.00	3.29
21.25	0.2	1.6	1.6	0.0	21.13	0.51	1.59	2.71	21.79	65.00	2.98
21.25	0.2	1.6	1.6	0.0	21.06	0.57	1.45	2.60	21.76	65.00	2.99
20.00	0.2	1.4	1.4	0.0	21.73	0.57	1.42	2.56	22.41	65.00	2.90
15.00	0.1	0.8	0.8	0.0	24.10	0.57	1.32	2.42	24.76	65.00	2.63
10.00	0.1	0.4	0.4	0.0	26.10	0.57	1.23	2.29	26.74	65.00	2.43
5.00	0.0	0.1	0.1	0.0	27.78	0.56	1.15	2.17	28.41	65.00	2.29
0.00	0.0	0.0	0.0	0.0	29.19	0.56	1.07	2.07	29.80	65.00	2.18

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.8	6.5	6.6	0.1	18.57	0.13	0.02	2.69	18.71	65.00	3.47
37.50	0.8	6.7	6.8	0.1	9.44	0.13	0.02	2.68	9.81	65.00	6.62
35.00	0.8	6.9	7.0	0.2	2.93	0.13	0.02	2.67	5.54	65.00	11.74
33.00	0.8	7.1	7.1	0.3	6.91	0.13	0.02	2.66	7.57	65.00	8.59
33.00	0.8	7.1	7.1	0.3	6.91	0.27	0.01	0.89	7.19	65.00	9.05
30.00	0.8	7.3	7.4	0.4	10.38	0.27	0.01	0.88	10.66	65.00	6.10
27.50	0.8	7.5	7.6	0.4	13.24	0.27	0.01	0.87	13.52	65.00	4.81
25.00	0.8	7.7	7.7	0.4	16.06	0.27	0.01	0.86	16.33	65.00	3.98
22.50	0.8	7.7	7.8	0.4	18.83	0.27	0.01	0.85	19.11	65.00	3.40
20.00	0.8	7.8	7.8	0.4	21.56	0.27	0.01	0.85	21.84	65.00	2.98
20.00	0.8	7.8	7.8	0.4	21.56	0.41	0.01	1.03	21.98	65.00	2.96
17.50	0.8	7.7	7.8	0.4	18.12	0.41	0.01	1.05	18.54	65.00	3.51
15.00	0.8	7.7	7.7	0.3	14.64	0.41	0.01	1.06	15.05	65.00	4.32
12.50	0.8	7.5	7.6	0.2	11.11	0.41	0.01	1.08	11.53	65.00	5.64
10.00	0.8	7.3	7.4	0.2	9.02	0.41	0.01	1.09	9.57	65.00	6.79
7.00	0.8	7.1	7.2	0.1	6.84	0.41	0.01	1.11	7.44	65.00	8.73
7.00	0.8	7.1	7.2	0.1	6.84	0.54	0.00	2.86	8.65	65.00	7.51
5.00	0.8	6.9	7.0	0.1	8.42	0.54	0.00	2.87	9.49	65.00	6.85
2.50	0.8	6.7	6.8	0.0	16.11	0.54	0.00	2.88	16.94	65.00	3.84
0.00	0.8	6.5	6.6	0.1	24.29	0.54	0.00	2.89	24.84	65.00	2.62

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	3.5	3.6	0.0	2.66	0.39	1.32	1.79	3.84	65.00	16.91
37.50	0.5	3.6	3.6	0.1	3.41	0.39	1.32	1.78	4.24	65.00	15.33
35.00	0.5	3.7	3.7	0.3	4.11	0.39	1.32	1.76	4.92	65.00	13.21
33.00	0.5	3.7	3.8	0.3	5.20	0.39	1.32	1.74	5.96	65.00	10.90
33.00	0.5	3.7	3.8	0.3	5.20	0.39	0.44	0.64	5.63	65.00	11.54
30.00	0.5	3.8	3.8	0.4	5.95	0.39	0.44	0.62	6.38	65.00	10.19
27.50	0.5	3.8	3.8	0.5	6.52	0.39	0.44	0.60	6.94	65.00	9.36
25.00	0.5	3.8	3.9	0.6	7.02	0.39	0.44	0.58	7.44	65.00	8.73
22.50	0.5	3.9	3.9	0.6	7.46	0.39	0.44	0.57	7.89	65.00	8.24
20.00	0.5	3.9	3.9	0.6	7.85	0.39	0.44	0.55	8.27	65.00	7.86
20.00	0.5	3.9	3.9	0.6	7.85	0.39	0.44	0.56	8.27	65.00	7.86
17.50	0.5	3.9	3.9	0.6	7.46	0.39	0.44	0.57	7.89	65.00	8.24
15.00	0.5	3.8	3.9	0.6	7.01	0.39	0.44	0.59	7.44	65.00	8.74
12.50	0.5	3.8	3.8	0.5	6.51	0.39	0.44	0.61	6.94	65.00	9.37
10.00	0.5	3.8	3.8	0.4	5.94	0.39	0.44	0.62	6.37	65.00	10.20
7.00	0.5	3.7	3.8	0.3	5.19	0.39	0.44	0.65	5.62	65.00	11.56
7.00	0.5	3.7	3.8	0.3	5.19	0.39	1.33	1.75	5.95	65.00	10.92
5.00	0.5	3.7	3.7	0.3	4.08	0.39	1.33	1.76	4.91	65.00	13.23
2.50	0.5	3.6	3.6	0.1	3.36	0.39	1.33	1.78	4.22	65.00	15.41
0.00	0.5	3.5	3.6	0.0	2.62	0.39	1.33	1.80	3.83	65.00	16.99

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.6	1.6	0.0	1.32	0.04	0.17	0.49	1.61	65.00	40.48
37.50	0.2	1.7	1.7	0.1	1.87	0.04	0.17	0.47	2.05	65.00	31.72
35.00	0.2	1.7	1.7	0.2	2.57	0.04	0.17	0.45	2.65	65.00	24.57
33.00	0.2	1.7	1.7	0.2	3.31	0.04	0.17	0.44	3.38	65.00	19.24
33.00	0.2	1.7	1.7	0.2	3.31	0.04	0.05	0.21	3.36	65.00	19.37
30.00	0.2	1.8	1.8	0.3	3.88	0.04	0.05	0.19	3.93	65.00	16.56
27.50	0.2	1.8	1.8	0.3	4.29	0.04	0.05	0.17	4.33	65.00	15.00
25.00	0.2	1.8	1.8	0.4	4.63	0.04	0.05	0.15	4.68	65.00	13.89
22.50	0.2	1.8	1.8	0.4	4.92	0.04	0.05	0.13	4.96	65.00	13.09
20.00	0.2	1.8	1.8	0.4	5.14	0.04	0.05	0.11	5.19	65.00	12.53
20.00	0.2	1.8	1.8	0.4	5.14	0.04	0.06	0.12	5.19	65.00	12.53
17.50	0.2	1.8	1.8	0.4	4.92	0.04	0.06	0.13	4.96	65.00	13.10
15.00	0.2	1.8	1.8	0.4	4.63	0.04	0.06	0.15	4.68	65.00	13.90
12.50	0.2	1.8	1.8	0.3	4.28	0.04	0.06	0.17	4.33	65.00	15.01
10.00	0.2	1.8	1.8	0.3	3.87	0.04	0.06	0.19	3.92	65.00	16.58
7.00	0.2	1.7	1.7	0.2	3.30	0.04	0.06	0.21	3.35	65.00	19.40
7.00	0.2	1.7	1.7	0.2	3.30	0.04	0.17	0.44	3.37	65.00	19.27
5.00	0.2	1.7	1.7	0.2	2.56	0.04	0.17	0.45	2.64	65.00	24.62
2.50	0.2	1.7	1.7	0.1	1.85	0.04	0.17	0.47	2.03	65.00	31.94
0.00	0.2	1.6	1.6	0.0	1.30	0.04	0.17	0.49	1.59	65.00	40.83

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	729	2404	2512	444
60.00	144	-47	152	0	785	2408	2533	751
55.00	289	-96	304	0	844	2412	2555	1075
50.00	434	-148	458	0	906	2415	2579	1415
48.00	492	-170	520	0	931	2417	2590	1556
48.00	492	-170	520	0	931	2416	2590	1556
45.00	579	-204	614	0	971	2420	2608	1878
45.00	580	320	662	596	3669	11558	12127	-843
40.00	1274	98	1277	596	3737	11564	12153	-285
35.00	1968	-128	1972	596	3804	11573	12182	306
32.00	2384	-266	2399	596	3844	11577	12199	677
32.00	2213	-265	2228	497	3357	11568	12045	4086
30.00	2490	-346	2514	497	3387	11570	12056	4332
30.00	2490	-348	2514	497	3510	11570	12091	4783
25.00	3185	-561	3234	497	3584	11570	12113	5431
21.25	3705	-724	3775	497	3644	11574	12134	5922
21.25	3686	-723	3756	442	3789	11578	12182	8234
20.00	3860	-780	3938	442	3806	11571	12181	8413
15.00	4554	-1011	4665	442	3884	11562	12197	9116
10.00	5248	-1246	5394	442	3965	11549	12211	9844
5.00	5941	-1487	6124	442	4047	11534	12224	10599
0.00	6633	-1732	6856	442	4139	11535	12255	11358

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	716	2408	2512	444
60.00	145	-46	152	0	772	2412	2533	751
55.00	289	-94	304	0	831	2416	2555	1074
50.00	435	-146	458	0	893	2420	2579	1415
48.00	493	-168	520	0	919	2422	2590	1556
48.00	493	-168	520	0	919	2421	2590	1556
45.00	580	-201	614	0	958	2425	2608	1878
45.00	579	170	603	-596	2513	11565	11834	2899
40.00	1273	17	1273	-596	2587	11567	11853	3465
35.00	1967	-141	1972	-596	2663	11569	11872	4057
32.00	2384	-238	2395	-596	2707	11573	11885	4419
32.00	2211	-238	2223	-497	3451	11645	12146	7825
30.00	2490	-321	2511	-497	3481	11648	12157	8071
30.00	2490	-323	2511	-497	3609	11644	12190	8522
25.00	3189	-542	3235	-497	3687	11637	12208	9170
21.25	3713	-709	3780	-497	3748	11641	12229	9661
21.25	3692	-709	3760	-442	3820	11656	12266	11960
20.00	3867	-767	3942	-442	3839	11645	12262	12139
15.00	4566	-1000	4674	-442	3921	11628	12272	12842
10.00	5264	-1238	5407	-442	4004	11609	12280	13571
5.00	5960	-1481	6141	-442	4089	11586	12286	14325
0.00	6655	-1729	6876	-442	4180	11587	12318	15085

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-596	524	794	-1	2724	9136	9533	-2706
37.50	-322	441	546	-1	2847	9133	9566	-2713
35.00	-48	353	357	-1	2970	9131	9602	-2715
33.00	171	281	329	-1	3070	9130	9633	-2715
33.00	171	282	330	-1	1836	3050	3560	-1275
30.00	281	213	352	-1	1986	3048	3638	-1275
27.50	372	151	402	-1	2111	3048	3707	-1274
25.00	464	86	472	-1	2235	3047	3779	-1273
22.50	555	17	555	-1	2360	3047	3854	-1271
20.00	647	-55	649	-1	2485	3046	3932	-1268
20.00	647	-55	649	-1	1253	-3039	3287	152
17.50	555	-94	563	-1	1378	-3040	3338	152
15.00	464	-137	484	-1	1503	-3042	3393	149
12.50	373	-184	416	-1	1629	-3044	3452	147
10.00	282	-235	367	-1	1754	-3045	3514	145
7.00	172	-301	347	-1	1904	-3047	3593	145
7.00	172	-300	346	-1	669	-9138	9163	1541
5.00	-47	-317	321	-1	768	-9139	9172	1542
2.50	-322	-342	470	-1	892	-9140	9184	1548
0.00	-596	-371	702	-1	1017	-9142	9198	1548

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	99	0	99	172	-3403	-10	3403	478
37.50	99	100	141	172	-3278	-12	3278	479
35.00	98	197	220	172	-3152	-15	3153	481
33.00	98	271	288	172	-3052	-15	3053	481
33.00	105	271	290	57	-1453	-30	1453	569
30.00	104	321	337	57	-1302	-31	1303	570
27.50	103	358	372	57	-1177	-32	1177	571
25.00	102	391	404	57	-1051	-34	1052	572
22.50	101	421	433	57	-926	-35	927	572
20.00	99	447	458	57	-801	-36	802	572
20.00	106	447	459	-58	799	-49	801	654
17.50	104	421	434	-58	925	-50	926	654
15.00	103	391	405	-58	1050	-51	1051	653
12.50	101	358	372	-58	1176	-52	1177	652
10.00	100	321	336	-58	1301	-53	1302	651
7.00	98	271	288	-58	1452	-55	1453	650
7.00	104	271	290	-174	3052	-69	3053	725
5.00	102	197	222	-174	3152	-70	3153	725
2.50	100	100	142	-174	3278	-73	3279	723
0.00	98	0	98	-174	3403	-75	3404	722

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	55	0	55	20	-2303	8	2303	-149
37.50	55	67	87	20	-2178	7	2178	-149
35.00	55	131	142	20	-2053	6	2053	-148
33.00	56	179	187	20	-1953	6	1953	-148
33.00	57	178	186	6	-1089	0	1089	-75
30.00	57	214	222	6	-939	-1	939	-75
27.50	57	240	247	6	-814	-2	814	-74
25.00	57	263	269	6	-689	-3	689	-74
22.50	56	282	287	6	-564	-3	564	-73
20.00	56	297	302	6	-439	-4	439	-73
20.00	57	296	301	-7	425	-10	425	-2
17.50	57	281	287	-7	550	-11	550	-2
15.00	57	263	269	-7	675	-12	675	-3
12.50	56	241	247	-7	800	-12	800	-3
10.00	56	215	222	-7	925	-13	925	-4
7.00	56	179	187	-7	1076	-14	1076	-4
7.00	57	178	186	-21	1940	-20	1940	64
5.00	56	130	141	-21	2040	-21	2040	64
2.50	55	67	87	-21	2165	-22	2165	63
0.00	55	0	55	-21	2290	-23	2290	63

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	6.7	6.8	0.0	0.01	0.03	0.00	0.29	0.50	65.00	99.90
60.00	1.2	5.9	6.0	0.0	1.46	0.04	0.00	0.28	1.50	65.00	43.33
55.00	1.0	5.1	5.2	0.0	2.63	0.06	0.00	0.26	2.69	65.00	24.16
50.00	0.9	4.4	4.5	0.0	3.59	0.07	0.00	0.25	3.66	65.00	17.77
48.00	0.9	4.1	4.2	0.0	3.92	0.07	0.00	0.25	3.99	65.00	16.27
48.00	0.9	4.1	4.2	0.0	2.65	0.05	0.00	0.17	2.70	65.00	24.06
45.00	0.8	3.7	3.7	0.0	2.95	0.06	0.00	0.16	3.01	65.00	21.58
45.00	0.8	3.7	3.7	0.0	3.10	0.03	1.40	2.17	4.75	65.00	13.67
40.00	0.7	3.0	3.0	0.0	5.53	0.01	1.28	2.01	6.26	65.00	10.39
35.00	0.5	2.3	2.4	0.0	7.81	0.01	1.17	1.88	8.08	65.00	8.05
32.00	0.5	2.0	2.0	0.0	9.10	0.02	1.12	1.80	9.31	65.00	6.98
32.00	0.5	2.0	2.0	0.0	8.47	0.11	0.93	1.61	8.73	65.00	7.45
30.00	0.4	1.7	1.8	0.0	9.26	0.12	0.90	1.57	9.51	65.00	6.84
30.00	0.4	1.7	1.8	0.0	9.27	0.13	0.90	1.57	9.52	65.00	6.83
25.00	0.3	1.2	1.3	0.0	11.04	0.14	0.83	1.48	11.27	65.00	5.77
21.25	0.2	0.9	0.9	0.0	12.18	0.15	0.79	1.41	12.40	65.00	5.24
21.25	0.2	0.9	0.9	0.0	12.12	0.21	0.70	1.33	12.38	65.00	5.25
20.00	0.2	0.8	0.8	0.0	12.47	0.21	0.69	1.31	12.73	65.00	5.11
15.00	0.1	0.4	0.5	0.0	13.73	0.22	0.64	1.24	13.99	65.00	4.65
10.00	0.1	0.2	0.2	0.0	14.78	0.23	0.59	1.17	15.04	65.00	4.32
5.00	0.0	0.1	0.1	0.0	15.67	0.24	0.55	1.11	15.93	65.00	4.08
0.00	0.0	0.0	0.0	0.0	16.40	0.25	0.52	1.06	16.67	65.00	3.90

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	6.7	6.8	0.0	0.01	0.03	0.00	0.29	0.50	65.00	99.90
60.00	1.2	5.9	6.0	0.0	1.46	0.04	0.00	0.28	1.50	65.00	43.32
55.00	1.0	5.1	5.2	0.0	2.64	0.06	0.00	0.26	2.69	65.00	24.16
50.00	0.9	4.4	4.5	0.0	3.59	0.07	0.00	0.25	3.66	65.00	17.76
48.00	0.9	4.1	4.2	0.0	3.92	0.07	0.00	0.25	4.00	65.00	16.27
48.00	0.9	4.1	4.2	0.0	2.65	0.05	0.00	0.17	2.70	65.00	24.05
45.00	0.8	3.7	3.7	0.0	2.95	0.06	0.00	0.16	3.01	65.00	21.57
45.00	0.8	3.7	3.7	0.0	2.91	0.09	1.40	2.15	4.40	65.00	14.77
40.00	0.7	3.0	3.0	0.0	5.44	0.10	1.28	2.00	6.20	65.00	10.48
35.00	0.5	2.3	2.4	0.0	7.82	0.12	1.17	1.86	8.18	65.00	7.95
32.00	0.5	2.0	2.0	0.0	9.07	0.12	1.12	1.79	9.39	65.00	6.92
32.00	0.5	2.0	2.0	0.0	8.43	0.22	0.93	1.62	8.80	65.00	7.38
30.00	0.4	1.7	1.8	0.0	9.24	0.22	0.90	1.58	9.59	65.00	6.77
30.00	0.4	1.7	1.8	0.0	9.24	0.23	0.90	1.58	9.61	65.00	6.76
25.00	0.3	1.2	1.3	0.0	11.04	0.24	0.83	1.48	11.38	65.00	5.71
21.25	0.2	0.9	0.9	0.0	12.19	0.25	0.79	1.42	12.52	65.00	5.19
21.25	0.2	0.9	0.9	0.0	12.12	0.31	0.70	1.33	12.50	65.00	5.20
20.00	0.2	0.8	0.8	0.0	12.48	0.31	0.69	1.31	12.85	65.00	5.06
15.00	0.1	0.4	0.5	0.0	13.75	0.31	0.64	1.24	14.11	65.00	4.61
10.00	0.1	0.2	0.2	0.0	14.82	0.32	0.59	1.18	15.18	65.00	4.28
5.00	0.0	0.1	0.1	0.0	15.71	0.33	0.55	1.12	16.07	65.00	4.05
0.00	0.0	0.0	0.0	0.0	16.45	0.33	0.52	1.07	16.81	65.00	3.87

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.8	3.7	3.7	0.0	11.95	0.18	0.01	1.33	12.14	65.00	5.35
37.50	0.8	3.7	3.8	0.1	8.44	0.18	0.01	1.33	8.80	65.00	7.39
35.00	0.8	3.9	3.9	0.1	5.49	0.18	0.01	1.34	5.94	65.00	10.95
33.00	0.8	3.9	4.0	0.1	5.17	0.18	0.01	1.35	5.83	65.00	11.15
33.00	0.8	3.9	4.0	0.1	5.18	0.09	0.01	0.50	5.33	65.00	12.18
30.00	0.8	4.1	4.1	0.1	5.43	0.09	0.01	0.52	5.56	65.00	11.70
27.50	0.8	4.1	4.2	0.1	6.40	0.09	0.01	0.53	6.52	65.00	9.96
25.00	0.8	4.2	4.3	0.1	7.34	0.09	0.01	0.53	7.47	65.00	8.70
22.50	0.8	4.3	4.3	0.0	8.27	0.09	0.01	0.54	8.39	65.00	7.75
20.00	0.8	4.3	4.3	0.0	9.84	0.09	0.01	0.55	9.93	65.00	6.54
20.00	0.8	4.3	4.3	0.0	9.84	0.01	0.01	0.47	9.86	65.00	6.59
17.50	0.8	4.3	4.3	0.0	8.74	0.01	0.01	0.47	8.77	65.00	7.41
15.00	0.8	4.2	4.3	-0.1	7.66	0.01	0.01	0.48	7.70	65.00	8.45
12.50	0.8	4.2	4.2	-0.1	6.60	0.01	0.01	0.49	6.65	65.00	9.78
10.00	0.8	4.1	4.1	-0.1	5.57	0.01	0.01	0.50	5.62	65.00	11.56
7.00	0.8	3.9	4.0	-0.1	5.47	0.01	0.01	0.51	5.55	65.00	11.72
7.00	0.8	3.9	4.0	-0.1	5.46	0.10	0.01	1.28	5.95	65.00	10.92
5.00	0.8	3.9	3.9	-0.1	4.95	0.10	0.01	1.28	5.43	65.00	11.96
2.50	0.8	3.8	3.8	0.0	6.99	0.11	0.01	1.28	7.36	65.00	8.83
0.00	0.8	3.7	3.7	0.0	11.02	0.11	0.01	1.29	11.14	65.00	5.83

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	2.0	2.0	0.0	1.46	0.03	1.32	1.79	3.44	65.00	18.87
37.50	0.5	2.0	2.0	0.1	2.07	0.03	1.32	1.78	3.67	65.00	17.71
35.00	0.5	2.0	2.1	0.2	3.49	0.03	1.32	1.76	4.36	65.00	14.89
33.00	0.5	2.0	2.1	0.3	4.58	0.03	1.32	1.74	5.28	65.00	12.31
33.00	0.5	2.0	2.1	0.3	4.62	0.04	0.44	0.64	4.74	65.00	13.70
30.00	0.5	2.1	2.1	0.4	5.34	0.04	0.44	0.62	5.45	65.00	11.92
27.50	0.5	2.1	2.1	0.5	5.88	0.04	0.44	0.60	5.99	65.00	10.86
25.00	0.5	2.1	2.2	0.5	6.37	0.04	0.44	0.58	6.47	65.00	10.05
22.50	0.5	2.1	2.2	0.6	6.80	0.04	0.44	0.57	6.89	65.00	9.43
20.00	0.5	2.1	2.2	0.6	7.17	0.04	0.44	0.55	7.26	65.00	8.95
20.00	0.5	2.1	2.2	0.6	7.21	0.04	0.45	0.56	7.30	65.00	8.90
17.50	0.5	2.1	2.2	0.6	6.82	0.04	0.45	0.58	6.92	65.00	9.39
15.00	0.5	2.1	2.2	0.5	6.38	0.04	0.45	0.59	6.48	65.00	10.03
12.50	0.5	2.1	2.1	0.5	5.88	0.04	0.45	0.61	5.99	65.00	10.86
10.00	0.5	2.1	2.1	0.4	5.32	0.04	0.45	0.63	5.44	65.00	11.95
7.00	0.5	2.0	2.1	0.3	4.58	0.04	0.45	0.65	4.71	65.00	13.80
7.00	0.5	2.0	2.1	0.3	4.62	0.05	1.33	1.76	5.33	65.00	12.20
5.00	0.5	2.0	2.1	0.2	3.51	0.05	1.33	1.77	4.40	65.00	14.78
2.50	0.5	2.0	2.0	0.1	2.08	0.05	1.33	1.79	3.70	65.00	17.57
0.00	0.5	2.0	2.0	0.0	1.44	0.05	1.33	1.80	3.46	65.00	18.78

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.9	0.9	0.0	0.81	0.01	0.15	0.47	1.14	65.00	56.95
37.50	0.2	0.9	0.9	0.1	1.32	0.01	0.15	0.45	1.42	65.00	45.75
35.00	0.2	0.9	1.0	0.2	2.26	0.01	0.15	0.44	2.29	65.00	28.35
33.00	0.2	0.9	1.0	0.2	2.97	0.01	0.15	0.42	2.99	65.00	21.75
33.00	0.2	0.9	1.0	0.2	2.96	0.01	0.05	0.20	2.96	65.00	21.95
30.00	0.2	1.0	1.0	0.3	3.49	0.01	0.05	0.18	3.50	65.00	18.58
27.50	0.2	1.0	1.0	0.3	3.88	0.01	0.05	0.16	3.88	65.00	16.73
25.00	0.2	1.0	1.0	0.4	4.21	0.01	0.05	0.14	4.22	65.00	15.42
22.50	0.2	1.0	1.0	0.4	4.49	0.00	0.05	0.13	4.49	65.00	14.47
20.00	0.2	1.0	1.0	0.4	4.71	0.00	0.05	0.11	4.71	65.00	13.79
20.00	0.2	1.0	1.0	0.4	4.70	0.00	0.06	0.12	4.70	65.00	13.83
17.50	0.2	1.0	1.0	0.4	4.48	0.00	0.06	0.13	4.48	65.00	14.50
15.00	0.2	1.0	1.0	0.4	4.21	0.00	0.06	0.15	4.21	65.00	15.44
12.50	0.2	1.0	1.0	0.3	3.88	0.00	0.06	0.17	3.88	65.00	16.73
10.00	0.2	1.0	1.0	0.3	3.50	0.00	0.06	0.18	3.50	65.00	18.56
7.00	0.2	0.9	1.0	0.2	2.97	0.00	0.06	0.21	2.97	65.00	21.87
7.00	0.2	0.9	1.0	0.2	2.96	0.00	0.16	0.43	2.99	65.00	21.71
5.00	0.2	0.9	1.0	0.2	2.25	0.00	0.16	0.44	2.30	65.00	28.24
2.50	0.2	0.9	0.9	0.1	1.32	0.00	0.16	0.46	1.44	65.00	45.14
0.00	0.2	0.9	0.9	0.0	0.81	0.00	0.16	0.48	1.16	65.00	56.12

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	708	2426	2527	442
60.00	149	-42	155	0	708	2486	2584	748
55.00	300	-85	311	0	709	2548	2645	1072
50.00	455	-128	472	0	710	2613	2708	1413
48.00	518	-145	537	0	710	2641	2734	1553
48.00	518	-145	537	0	710	2640	2734	1554
45.00	613	-170	637	0	710	2683	2776	1876
45.00	615	275	674	607	3390	12089	12556	-520
40.00	1343	72	1344	607	3391	12164	12628	37
35.00	2075	-131	2079	607	3382	12243	12702	640
32.00	2516	-253	2529	607	3383	12291	12748	1002
32.00	2344	-252	2358	523	2762	12619	12917	4408
30.00	2647	-319	2666	523	2763	12651	12949	4654
30.00	2649	-319	2668	523	2760	12776	13071	5106
25.00	3418	-484	3452	523	2757	12852	13144	5756
21.25	3998	-608	4044	523	2758	12915	13206	6247
21.25	3976	-608	4023	486	2797	13226	13518	8552
20.00	4175	-650	4225	486	2794	13239	13530	8733
15.00	4972	-817	5039	486	2789	13310	13599	9440
10.00	5773	-984	5856	486	2784	13381	13668	10174
5.00	6579	-1151	6679	486	2779	13452	13736	10933
0.00	7389	-1318	7505	486	2779	13544	13826	11692

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	694	2430	2527	442
60.00	149	-42	155	0	695	2489	2584	748
55.00	300	-83	311	0	695	2552	2645	1072
50.00	455	-125	472	0	695	2617	2708	1413
48.00	518	-142	537	0	696	2644	2734	1553
48.00	518	-142	537	0	696	2644	2734	1554
45.00	614	-167	637	0	696	2687	2776	1876
45.00	615	124	627	-609	2213	12106	12306	2549
40.00	1343	-9	1343	-609	2220	12176	12377	3117
35.00	2076	-143	2081	-609	2225	12249	12450	3710
32.00	2518	-223	2528	-609	2226	12297	12497	4071
32.00	2346	-223	2356	-526	2857	12628	12947	7475
30.00	2649	-292	2665	-526	2858	12660	12979	7722
30.00	2651	-292	2667	-526	2860	12782	13098	8174
25.00	3420	-464	3452	-526	2863	12852	13167	8823
21.25	4000	-592	4044	-526	2863	12915	13229	9315
21.25	3978	-593	4022	-490	2828	13225	13524	11620
20.00	4177	-635	4225	-490	2828	13234	13533	11801
15.00	4974	-805	5038	-490	2828	13299	13596	12508
10.00	5774	-975	5856	-490	2827	13364	13659	13241
5.00	6579	-1145	6677	-490	2825	13428	13722	14000
0.00	7387	-1314	7503	-490	2826	13520	13812	14760

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-607	446	753	-2	2399	9404	9705	-2688
37.50	-325	372	494	-2	2522	9370	9704	-2694
35.00	-44	294	298	-2	2646	9338	9705	-2696
33.00	179	230	291	-2	2745	9312	9708	-2696
33.00	179	230	291	-1	1505	3214	3549	-1273
30.00	295	173	341	-1	1655	3175	3580	-1273
27.50	389	121	408	-1	1779	3143	3612	-1272
25.00	483	66	488	-1	1903	3112	3648	-1270
22.50	576	7	576	-1	2028	3080	3688	-1268
20.00	668	-56	670	-1	2153	3049	3732	-1265
20.00	668	-56	670	0	914	-3053	3187	136
17.50	576	-85	582	0	1039	-3086	3256	136
15.00	483	-118	497	0	1163	-3118	3328	133
12.50	389	-155	418	0	1288	-3151	3404	130
10.00	294	-195	353	0	1413	-3183	3483	129
7.00	178	-249	306	0	1562	-3222	3581	128
7.00	178	-249	306	1	321	-9331	9336	1503
5.00	-46	-258	262	1	421	-9357	9366	1505
2.50	-327	-272	425	1	545	-9388	9404	1510
0.00	-609	-290	675	1	669	-9421	9444	1510

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	83	0	83	173	-3400	328	3416	611
37.50	93	100	137	173	-3275	294	3288	612
35.00	101	197	221	173	-3150	261	3161	613
33.00	107	271	291	173	-3050	236	3060	614
33.00	107	271	291	57	-1451	187	1463	620
30.00	114	320	340	57	-1300	149	1309	621
27.50	117	358	376	57	-1175	116	1181	622
25.00	121	391	409	57	-1050	84	1053	623
22.50	123	421	438	57	-925	52	926	624
20.00	124	446	463	57	-800	20	800	624
20.00	124	446	463	-58	800	-26	800	624
17.50	122	421	438	-58	925	-58	927	624
15.00	120	391	409	-58	1050	-91	1054	623
12.50	117	358	376	-58	1175	-123	1182	622
10.00	113	320	340	-58	1300	-155	1310	621
7.00	106	271	291	-58	1451	-194	1463	620
7.00	106	271	291	-173	3050	-242	3060	614
5.00	100	197	221	-173	3150	-268	3162	613
2.50	92	100	136	-173	3275	-301	3289	612
0.00	82	0	82	-173	3400	-334	3416	611

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	37	0	37	22	-2294	315	2316	-45
37.50	46	67	81	22	-2170	284	2188	-44
35.00	54	130	141	22	-2045	252	2060	-44
33.00	60	178	188	22	-1945	226	1958	-43
33.00	60	178	188	7	-1081	185	1097	-41
30.00	66	214	224	7	-931	146	943	-41
27.50	69	240	250	7	-806	115	815	-40
25.00	72	263	272	7	-682	83	687	-40
22.50	74	281	291	7	-557	51	559	-39
20.00	75	296	306	7	-432	20	432	-39
20.00	75	296	306	-7	432	-22	432	-39
17.50	74	281	291	-7	557	-54	559	-39
15.00	72	263	272	-7	682	-86	687	-40
12.50	69	240	250	-7	806	-117	815	-40
10.00	65	214	224	-7	931	-149	943	-41
7.00	59	178	188	-7	1081	-187	1097	-41
7.00	59	178	188	-22	1945	-229	1958	-43
5.00	53	130	141	-22	2045	-254	2061	-44
2.50	45	67	81	-22	2170	-286	2188	-44
0.00	36	0	36	-22	2294	-318	2316	-45

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	7.3	7.4	0.0	0.01	0.03	0.00	0.29	0.51	65.00	99.90
60.00	1.0	6.4	6.5	0.0	1.49	0.04	0.00	0.28	1.53	65.00	42.51
55.00	0.8	5.6	5.7	0.0	2.70	0.06	0.00	0.27	2.76	65.00	23.59
50.00	0.7	4.8	4.8	0.0	3.70	0.07	0.00	0.27	3.77	65.00	17.22
48.00	0.7	4.5	4.5	0.0	4.06	0.07	0.00	0.27	4.13	65.00	15.73
48.00	0.7	4.5	4.5	0.0	2.74	0.05	0.00	0.18	2.79	65.00	23.26
45.00	0.6	4.0	4.0	0.0	3.07	0.06	0.00	0.18	3.13	65.00	20.76
45.00	0.6	4.0	4.0	0.0	3.21	0.02	1.43	2.22	4.78	65.00	13.61
40.00	0.5	3.2	3.3	0.0	5.79	0.00	1.30	2.07	6.49	65.00	10.01
35.00	0.4	2.5	2.6	0.0	8.23	0.02	1.20	1.93	8.50	65.00	7.65
32.00	0.4	2.1	2.2	0.0	9.58	0.03	1.14	1.86	9.81	65.00	6.63
32.00	0.4	2.1	2.2	0.0	8.94	0.12	0.98	1.71	9.23	65.00	7.04
30.00	0.3	1.9	1.9	0.0	9.80	0.13	0.95	1.67	10.07	65.00	6.45
30.00	0.3	1.9	1.9	0.0	9.81	0.14	0.95	1.67	10.09	65.00	6.44
25.00	0.2	1.3	1.4	0.0	11.74	0.15	0.88	1.57	12.00	65.00	5.42
21.25	0.2	1.0	1.0	0.0	12.99	0.16	0.83	1.51	13.24	65.00	4.91
21.25	0.2	1.0	1.0	0.0	12.93	0.22	0.77	1.47	13.22	65.00	4.92
20.00	0.2	0.9	0.9	0.0	13.33	0.22	0.75	1.45	13.62	65.00	4.77
15.00	0.1	0.5	0.5	0.0	14.77	0.23	0.70	1.37	15.05	65.00	4.32
10.00	0.0	0.2	0.2	0.0	15.99	0.24	0.65	1.30	16.27	65.00	4.00
5.00	0.0	0.1	0.1	0.0	17.02	0.25	0.61	1.24	17.30	65.00	3.76
0.00	0.0	0.0	0.0	0.0	17.89	0.26	0.57	1.18	18.18	65.00	3.57

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	7.3	7.4	0.0	0.01	0.03	0.00	0.29	0.51	65.00	99.90
60.00	1.0	6.4	6.5	0.0	1.49	0.04	0.00	0.28	1.53	65.00	42.51
55.00	0.8	5.6	5.7	0.0	2.70	0.06	0.00	0.27	2.76	65.00	23.59
50.00	0.7	4.8	4.8	0.0	3.71	0.07	0.00	0.27	3.77	65.00	17.22
48.00	0.7	4.5	4.5	0.0	4.06	0.07	0.00	0.27	4.13	65.00	15.73
48.00	0.7	4.5	4.5	0.0	2.74	0.05	0.00	0.18	2.79	65.00	23.26
45.00	0.6	4.0	4.0	0.0	3.07	0.06	0.00	0.18	3.13	65.00	20.76
45.00	0.6	4.0	4.0	0.0	3.02	0.08	1.43	2.21	4.43	65.00	14.66
40.00	0.5	3.2	3.3	0.0	5.73	0.09	1.31	2.05	6.45	65.00	10.08
35.00	0.4	2.5	2.6	0.0	8.25	0.11	1.20	1.92	8.58	65.00	7.57
32.00	0.4	2.1	2.2	0.0	9.56	0.11	1.14	1.84	9.85	65.00	6.60
32.00	0.4	2.1	2.2	0.0	8.92	0.21	0.99	1.72	9.27	65.00	7.01
30.00	0.3	1.9	1.9	0.0	9.78	0.21	0.95	1.67	10.12	65.00	6.42
30.00	0.3	1.9	1.9	0.0	9.79	0.22	0.95	1.68	10.14	65.00	6.41
25.00	0.2	1.3	1.4	0.0	11.73	0.23	0.88	1.58	12.06	65.00	5.39
21.25	0.2	1.0	1.0	0.0	12.99	0.24	0.83	1.52	13.30	65.00	4.89
21.25	0.2	1.0	1.0	0.0	12.92	0.30	0.77	1.47	13.28	65.00	4.89
20.00	0.1	0.9	0.9	0.0	13.32	0.30	0.76	1.45	13.68	65.00	4.75
15.00	0.1	0.5	0.5	0.0	14.76	0.31	0.71	1.38	15.11	65.00	4.30
10.00	0.0	0.2	0.2	0.0	15.98	0.31	0.66	1.31	16.33	65.00	3.98
5.00	0.0	0.1	0.1	0.0	17.01	0.32	0.61	1.24	17.36	65.00	3.74
0.00	0.0	0.0	0.0	0.0	17.89	0.33	0.57	1.19	18.24	65.00	3.56

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	4.0	4.0	0.0	11.63	0.18	0.01	1.36	11.82	65.00	5.50
37.50	0.6	4.1	4.1	0.1	7.44	0.18	0.01	1.36	7.84	65.00	8.29
35.00	0.6	4.2	4.2	0.1	4.60	0.18	0.01	1.36	5.11	65.00	12.71
33.00	0.6	4.3	4.3	0.1	4.47	0.18	0.01	1.36	5.19	65.00	12.52
33.00	0.6	4.3	4.3	0.1	4.47	0.09	0.01	0.50	4.63	65.00	14.03
30.00	0.6	4.4	4.5	0.1	5.38	0.09	0.01	0.50	5.51	65.00	11.81
27.50	0.6	4.5	4.6	0.1	6.46	0.09	0.01	0.51	6.58	65.00	9.88
25.00	0.6	4.6	4.6	0.0	7.50	0.09	0.01	0.52	7.62	65.00	8.53
22.50	0.6	4.6	4.7	0.0	8.51	0.09	0.01	0.52	8.63	65.00	7.53
20.00	0.6	4.6	4.7	0.0	10.16	0.09	0.01	0.53	10.25	65.00	6.34
20.00	0.6	4.6	4.7	0.0	10.16	0.01	0.00	0.44	10.18	65.00	6.39
17.50	0.6	4.6	4.7	0.0	8.98	0.01	0.00	0.45	9.01	65.00	7.22
15.00	0.6	4.6	4.6	0.0	7.82	0.01	0.00	0.46	7.84	65.00	8.29
12.50	0.6	4.5	4.6	-0.1	6.66	0.01	0.00	0.48	6.69	65.00	9.71
10.00	0.6	4.4	4.5	-0.1	5.51	0.01	0.00	0.49	5.55	65.00	11.71
7.00	0.6	4.3	4.3	-0.1	4.74	0.01	0.00	0.50	4.83	65.00	13.46
7.00	0.6	4.3	4.3	-0.1	4.74	0.10	0.00	1.31	5.28	65.00	12.31
5.00	0.6	4.2	4.2	0.0	4.07	0.10	0.00	1.31	4.64	65.00	14.01
2.50	0.6	4.1	4.1	0.0	6.46	0.10	0.00	1.32	6.61	65.00	9.84
0.00	0.6	4.0	4.0	0.0	10.72	0.10	0.00	1.32	10.85	65.00	5.99

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	2.1	2.2	0.0	1.23	0.04	1.32	1.80	3.36	65.00	19.33
37.50	0.4	2.2	2.2	0.1	2.04	0.04	1.32	1.78	3.61	65.00	18.01
35.00	0.4	2.2	2.3	0.2	3.50	0.04	1.32	1.76	4.35	65.00	14.93
33.00	0.4	2.2	2.3	0.3	4.63	0.04	1.32	1.75	5.31	65.00	12.24
33.00	0.4	2.2	2.3	0.3	4.64	0.04	0.44	0.64	4.75	65.00	13.67
30.00	0.4	2.3	2.3	0.4	5.40	0.04	0.44	0.62	5.51	65.00	11.80
27.50	0.4	2.3	2.3	0.5	5.97	0.04	0.44	0.60	6.07	65.00	10.71
25.00	0.4	2.3	2.3	0.5	6.48	0.04	0.44	0.59	6.58	65.00	9.88
22.50	0.4	2.3	2.4	0.6	6.93	0.04	0.44	0.57	7.02	65.00	9.26
20.00	0.4	2.3	2.4	0.6	7.31	0.04	0.44	0.55	7.40	65.00	8.78
17.50	0.4	2.3	2.4	0.6	6.93	0.04	0.44	0.57	7.02	65.00	9.26
15.00	0.4	2.3	2.3	0.5	6.48	0.04	0.44	0.59	6.57	65.00	9.89
12.50	0.4	2.3	2.3	0.5	5.97	0.04	0.44	0.61	6.07	65.00	10.71
10.00	0.4	2.3	2.3	0.4	5.40	0.04	0.44	0.62	5.50	65.00	11.81
7.00	0.4	2.2	2.3	0.3	4.63	0.04	0.44	0.65	4.75	65.00	13.69
7.00	0.4	2.2	2.3	0.3	4.63	0.04	1.33	1.75	5.31	65.00	12.24
5.00	0.4	2.2	2.3	0.2	3.50	0.04	1.33	1.77	4.35	65.00	14.95
2.50	0.4	2.2	2.2	0.1	2.03	0.04	1.33	1.78	3.60	65.00	18.05
0.00	0.4	2.1	2.2	0.0	1.20	0.04	1.33	1.80	3.36	65.00	19.36

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.0	1.0	0.0	0.54	0.00	0.17	0.49	1.00	65.00	64.84
37.50	0.2	1.0	1.0	0.1	1.26	0.00	0.17	0.47	1.33	65.00	48.89
35.00	0.2	1.0	1.0	0.2	2.24	0.00	0.17	0.45	2.28	65.00	28.54
33.00	0.2	1.0	1.1	0.2	2.98	0.00	0.17	0.44	3.01	65.00	21.63
33.00	0.2	1.0	1.1	0.2	2.98	0.00	0.06	0.21	2.98	65.00	21.79
30.00	0.2	1.1	1.1	0.3	3.55	0.00	0.06	0.19	3.55	65.00	18.30
27.50	0.2	1.1	1.1	0.3	3.96	0.00	0.06	0.17	3.96	65.00	16.42
25.00	0.2	1.1	1.1	0.4	4.30	0.00	0.06	0.15	4.30	65.00	15.10
22.50	0.2	1.1	1.1	0.4	4.59	0.00	0.06	0.13	4.59	65.00	14.16
20.00	0.2	1.1	1.1	0.4	4.81	0.00	0.06	0.12	4.81	65.00	13.50
17.50	0.2	1.1	1.1	0.4	4.59	0.00	0.06	0.13	4.59	65.00	14.16
15.00	0.2	1.1	1.1	0.4	4.30	0.00	0.06	0.15	4.30	65.00	15.10
12.50	0.2	1.1	1.1	0.3	3.95	0.00	0.06	0.17	3.96	65.00	16.43
10.00	0.2	1.1	1.1	0.3	3.55	0.00	0.06	0.19	3.55	65.00	18.31
7.00	0.2	1.0	1.1	0.2	2.98	0.00	0.06	0.21	2.98	65.00	21.81
7.00	0.2	1.0	1.1	0.2	2.98	0.00	0.17	0.44	3.00	65.00	21.64
5.00	0.2	1.0	1.0	0.2	2.24	0.00	0.17	0.45	2.27	65.00	28.58
2.50	0.2	1.0	1.0	0.1	1.26	0.00	0.17	0.47	1.33	65.00	48.99
0.00	0.2	1.0	1.0	0.0	0.53	0.00	0.17	0.49	1.00	65.00	65.05

BY VALMONT INDUSTRIES FOR:
Design Id:Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.18	2.40	0.01	2.40	0.144		0.035	
	7.0000	0.18	2.40	0.01	2.40	0.144		0.035	
	20.0000	0.40	2.40	0.20	2.40	0.167		0.091	
	20.0000	0.40	2.40	0.20	2.40	0.167		0.091	
	33.0000	0.18	2.40	0.16	2.40	0.033		0.037	
	33.0000	0.18	2.40	0.16	2.40	0.033		0.037	
Arm 2	7.0000	0.06	2.40	0.20	2.40	0.205		0.017	
	20.0000	0.11	2.40	0.37	2.40	0.148		0.010	
	33.0000	0.06	2.40	0.20	2.40	0.204		0.022	
Arm 3	7.0000	0.03	2.40	0.18	2.40	0.176		0.010	
	7.0000	0.03	2.40	0.18	2.40	0.176		0.010	
	20.0000	0.06	2.40	0.34	2.40	0.133		0.006	
	20.0000	0.06	2.40	0.34	2.40	0.133		0.006	
	33.0000	0.03	2.40	0.18	2.40	0.175		0.012	
	33.0000	0.03	2.40	0.18	2.40	0.175		0.012	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	148	403	429	534
60.00	24	-18	30	0	371	404	548	840
55.00	48	-48	68	0	605	405	728	1163
50.00	73	-91	117	0	851	407	943	1502
48.00	83	-113	140	0	953	408	1036	1643
48.00	83	-113	140	0	953	407	1036	1643
45.00	97	-150	179	0	1109	409	1182	1965
45.00	99	-162	190	378	-1163	6156	6265	5323
40.00	468	-100	479	378	-895	6157	6221	5882
35.00	838	-55	840	378	-614	6157	6187	6467
32.00	1060	-36	1060	378	-438	6158	6174	6828
32.00	975	-36	976	316	3545	6047	7009	9023
30.00	1120	-123	1127	316	3664	6048	7071	9269
30.00	1120	-130	1127	316	4133	6045	7323	9471
25.00	1483	-387	1532	316	4438	6042	7497	10108
21.25	1755	-592	1852	316	4676	6044	7642	10599
21.25	1740	-592	1838	282	4634	6026	7602	12675
20.00	1830	-662	1946	282	4712	6021	7646	12846
15.00	2192	-955	2391	282	5038	6014	7845	13536
10.00	2553	-1267	2850	282	5374	6004	8058	14251
5.00	2913	-1600	3323	282	5721	5994	8286	14992
0.00	3273	-1954	3812	282	6088	5994	8543	15752

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	403	429	534
60.00	24	-18	30	0	369	405	548	840
55.00	49	-47	68	0	603	408	728	1163
50.00	73	-91	117	0	849	410	943	1502
48.00	83	-113	140	0	951	411	1036	1643
48.00	83	-113	140	0	951	411	1036	1643
45.00	98	-150	179	0	1107	413	1182	1965
45.00	96	657	664	-370	5048	6129	7940	8645
40.00	464	346	579	-370	5319	6132	8117	9202
35.00	832	18	832	-370	5607	6127	8305	9787
32.00	1052	-187	1069	-370	5783	6128	8426	10148
32.00	965	-187	983	-307	2542	6249	6746	12357
30.00	1115	-250	1142	-307	2661	6250	6793	12603
30.00	1115	-257	1144	-307	3131	6246	6987	12805
25.00	1489	-454	1557	-307	3437	6241	7125	13442
21.25	1770	-614	1874	-307	3675	6243	7244	13934
21.25	1753	-614	1857	-271	4449	6266	7685	15963
20.00	1847	-681	1968	-271	4528	6259	7725	16133
15.00	2222	-963	2422	-271	4854	6248	7912	16823
10.00	2597	-1265	2889	-271	5191	6234	8112	17539
5.00	2971	-1587	3368	-271	5538	6220	8328	18280
0.00	3344	-1930	3861	-271	5904	6220	8576	19040

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-378	-12	378	-2	-3357	5748	6657	2270
37.50	-206	87	223	-2	-3233	5748	6594	2270
35.00	-33	182	185	-2	-3107	5748	6534	2270
33.00	105	255	276	-2	-3007	5748	6487	2270
33.00	105	257	278	-2	-327	1934	1962	2833
30.00	174	266	318	-2	-176	1933	1941	2834
27.50	232	270	356	-2	-50	1931	1932	2835
25.00	290	269	396	-2	77	1929	1931	2836
22.50	348	265	438	-2	203	1927	1938	2837
20.00	406	257	480	-2	328	1927	1954	2837
20.00	406	259	481	-2	3009	-1890	3553	3384
17.50	349	167	387	-2	3134	-1891	3660	3384
15.00	292	71	301	-2	3260	-1894	3771	3381
12.50	235	-29	237	-2	3386	-1896	3881	3380
10.00	178	-132	222	-2	3511	-1899	3992	3379
7.00	110	-261	283	-2	3661	-1901	4125	3379
7.00	110	-259	282	-2	6339	-5717	8536	3920
5.00	-27	-413	414	-2	6436	-5718	8609	3924
2.50	-199	-608	639	-2	6557	-5718	8700	3933
0.00	-370	-806	887	-2	6682	-5719	8795	3933

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	62	0	62	85	-2191	-110	2194	-3985
37.50	59	64	87	85	-2067	-110	2069	-3985
35.00	56	124	136	85	-1942	-111	1945	-3984
33.00	53	169	178	85	-1843	-111	1846	-3984
33.00	72	169	184	27	-1044	-114	1050	-3737
30.00	68	204	215	27	-894	-115	902	-3737
27.50	65	229	238	27	-771	-115	779	-3736
25.00	61	250	258	27	-647	-115	657	-3736
22.50	58	268	274	27	-524	-115	536	-3735
20.00	54	282	287	27	-401	-115	417	-3735
20.00	73	282	291	-30	398	-118	415	-3490
17.50	70	268	277	-30	521	-118	534	-3490
15.00	66	251	259	-30	645	-118	656	-3491
12.50	63	229	238	-30	769	-118	778	-3491
10.00	59	204	213	-30	893	-118	901	-3492
7.00	55	170	178	-30	1043	-119	1050	-3492
7.00	74	169	185	-88	1843	-122	1847	-3249
5.00	71	124	143	-88	1942	-123	1946	-3250
2.50	67	64	93	-88	2068	-123	2071	-3250
0.00	63	0	63	-88	2193	-124	2196	-3251

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	34	0	34	15	-2074	-14	2074	39
37.50	34	60	69	15	-1949	-15	1949	40
35.00	33	117	122	15	-1824	-15	1824	40
33.00	33	160	163	15	-1724	-16	1724	40
33.00	36	156	160	4	-1025	-18	1025	285
30.00	36	190	193	4	-875	-18	875	285
27.50	35	214	217	4	-750	-19	750	286
25.00	35	235	237	4	-625	-19	625	286
22.50	34	252	254	4	-500	-19	500	287
20.00	34	265	267	4	-375	-20	375	287
20.00	37	261	264	-7	326	-22	326	529
17.50	37	249	252	-7	451	-22	451	529
15.00	36	234	237	-7	576	-23	577	529
12.50	35	215	218	-7	702	-23	702	529
10.00	35	192	195	-7	827	-24	827	528
7.00	34	159	163	-7	978	-24	978	528
7.00	37	156	160	-18	1678	-27	1678	769
5.00	37	114	120	-18	1778	-27	1779	769
2.50	36	59	69	-18	1904	-28	1904	768
0.00	35	0	35	-18	2029	-28	2030	768

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	3.1	3.3	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	1.2	2.8	3.0	0.0	0.29	0.05	0.00	0.06	0.34	65.00	99.90
55.00	1.0	2.4	2.6	0.0	0.59	0.06	0.00	0.08	0.65	65.00	99.90
50.00	0.9	2.1	2.3	0.0	0.91	0.07	0.00	0.09	0.99	65.00	65.92
48.00	0.8	1.9	2.1	0.0	1.04	0.08	0.00	0.10	1.13	65.00	57.77
48.00	0.8	1.9	2.1	0.0	0.71	0.05	0.00	0.07	0.76	65.00	85.47
45.00	0.8	1.7	1.9	0.0	0.84	0.06	0.00	0.07	0.91	65.00	71.65
45.00	0.8	1.7	1.9	0.0	0.89	0.17	0.89	1.28	2.46	65.00	26.44
40.00	0.6	1.4	1.6	0.0	2.11	0.18	0.81	1.19	2.83	65.00	23.00
35.00	0.5	1.1	1.2	0.0	3.32	0.18	0.75	1.10	3.82	65.00	17.01
32.00	0.5	0.9	1.1	0.0	3.96	0.19	0.71	1.06	4.39	65.00	14.80
32.00	0.5	0.9	1.1	0.0	3.65	0.25	0.59	0.99	3.99	65.00	16.29
30.00	0.4	0.8	0.9	0.0	4.13	0.25	0.57	0.97	4.46	65.00	14.57
30.00	0.4	0.8	0.9	0.0	4.14	0.26	0.57	0.98	4.47	65.00	14.55
25.00	0.3	0.6	0.7	0.0	5.25	0.27	0.53	0.93	5.56	65.00	11.70
21.25	0.2	0.4	0.5	0.0	5.98	0.27	0.50	0.89	6.28	65.00	10.36
21.25	0.2	0.4	0.5	0.0	5.93	0.32	0.45	0.84	6.27	65.00	10.36
20.00	0.2	0.4	0.4	0.0	6.15	0.33	0.44	0.83	6.50	65.00	10.01
15.00	0.1	0.2	0.3	0.0	6.96	0.33	0.41	0.79	7.31	65.00	8.90
10.00	0.1	0.1	0.1	0.0	7.66	0.34	0.38	0.76	8.00	65.00	8.12
5.00	0.0	0.0	0.0	0.0	8.26	0.34	0.35	0.73	8.60	65.00	7.55
0.00	0.0	0.0	0.0	0.0	8.84	0.35	0.33	0.71	9.21	65.00	7.06

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	3.1	3.3	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	1.1	2.8	3.0	0.0	0.29	0.05	0.00	0.06	0.34	65.00	99.90
55.00	1.0	2.4	2.6	0.0	0.59	0.06	0.00	0.08	0.65	65.00	99.90
50.00	0.9	2.1	2.3	0.0	0.91	0.07	0.00	0.09	0.99	65.00	65.93
48.00	0.8	2.0	2.1	0.0	1.04	0.08	0.00	0.10	1.13	65.00	57.77
48.00	0.8	2.0	2.1	0.0	0.71	0.05	0.00	0.07	0.76	65.00	85.47
45.00	0.8	1.8	1.9	0.0	0.84	0.06	0.00	0.07	0.91	65.00	71.63
45.00	0.8	1.8	1.9	0.0	3.18	0.27	0.87	1.37	4.15	65.00	15.67
40.00	0.7	1.4	1.6	0.0	2.52	0.27	0.80	1.28	3.57	65.00	18.19
35.00	0.5	1.1	1.3	0.0	3.26	0.28	0.73	1.21	4.05	65.00	16.05
32.00	0.5	1.0	1.1	0.0	4.09	0.28	0.69	1.17	4.65	65.00	13.97
32.00	0.5	1.0	1.1	0.0	3.76	0.34	0.57	0.95	4.25	65.00	15.31
30.00	0.4	0.9	0.9	0.0	4.24	0.35	0.56	0.93	4.70	65.00	13.82
30.00	0.4	0.9	0.9	0.0	4.24	0.35	0.56	0.94	4.73	65.00	13.76
25.00	0.3	0.6	0.7	0.0	5.33	0.35	0.51	0.89	5.78	65.00	11.24
21.25	0.2	0.4	0.5	0.0	6.04	0.36	0.48	0.86	6.48	65.00	10.03
21.25	0.2	0.4	0.5	0.0	5.99	0.41	0.43	0.83	6.47	65.00	10.04
20.00	0.2	0.4	0.4	0.0	6.22	0.41	0.42	0.82	6.70	65.00	9.70
15.00	0.1	0.2	0.3	0.0	7.06	0.41	0.39	0.78	7.53	65.00	8.64
10.00	0.1	0.1	0.1	0.0	7.77	0.41	0.36	0.75	8.24	65.00	7.89
5.00	0.0	0.0	0.0	0.0	8.39	0.42	0.34	0.72	8.85	65.00	7.34
0.00	0.0	0.0	0.0	0.0	8.93	0.42	0.32	0.70	9.39	65.00	6.93

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.8	1.7	1.9	0.0	5.63	0.15	0.01	0.94	5.79	65.00	11.22
37.50	0.8	1.8	2.0	0.1	3.55	0.15	0.01	0.93	3.92	65.00	16.58
35.00	0.8	1.9	2.0	0.1	2.88	0.15	0.01	0.92	3.42	65.00	18.98
33.00	0.8	1.9	2.1	0.2	4.39	0.15	0.01	0.91	4.66	65.00	13.95
33.00	0.8	1.9	2.1	0.2	4.42	0.19	0.01	0.29	4.63	65.00	14.04
30.00	0.8	2.0	2.1	0.2	4.98	0.19	0.01	0.28	5.19	65.00	12.53
27.50	0.8	2.1	2.2	0.2	5.38	0.19	0.01	0.28	5.59	65.00	11.63
25.00	0.8	2.1	2.2	0.2	5.90	0.19	0.01	0.28	6.10	65.00	10.65
22.50	0.8	2.1	2.3	0.2	6.73	0.19	0.01	0.28	6.93	65.00	9.38
20.00	0.8	2.1	2.3	0.2	7.53	0.19	0.01	0.29	7.73	65.00	8.41
20.00	0.8	2.1	2.3	0.2	7.54	0.23	0.01	0.51	7.79	65.00	8.34
17.50	0.8	2.1	2.3	0.2	6.15	0.23	0.01	0.52	6.40	65.00	10.15
15.00	0.8	2.1	2.2	0.1	4.73	0.23	0.01	0.54	4.99	65.00	13.02
12.50	0.8	2.1	2.2	0.1	3.64	0.23	0.01	0.55	3.98	65.00	16.33
10.00	0.8	2.0	2.2	0.0	3.43	0.23	0.01	0.57	3.79	65.00	17.16
7.00	0.8	1.9	2.1	0.0	4.51	0.23	0.01	0.58	4.80	65.00	13.53
7.00	0.8	1.9	2.1	0.0	4.48	0.27	0.01	1.20	5.11	65.00	12.73
5.00	0.8	1.9	2.0	0.0	6.23	0.27	0.01	1.21	6.54	65.00	9.95
2.50	0.8	1.8	2.0	0.0	10.14	0.27	0.01	1.22	10.43	65.00	6.23
0.00	0.8	1.8	1.9	0.0	14.10	0.27	0.01	1.24	14.39	65.00	4.52

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	0.9	1.1	0.0	0.92	0.27	0.65	0.96	1.78	65.00	36.58
37.50	0.5	1.0	1.1	0.1	1.30	0.27	0.65	0.94	1.88	65.00	34.64
35.00	0.5	1.0	1.1	0.1	2.16	0.27	0.65	0.92	2.60	65.00	24.98
33.00	0.5	1.0	1.1	0.2	2.81	0.27	0.65	0.91	3.22	65.00	20.17
33.00	0.5	1.0	1.1	0.2	2.93	0.25	0.21	0.35	3.19	65.00	20.37
30.00	0.5	1.0	1.1	0.3	3.42	0.25	0.21	0.33	3.68	65.00	17.67
27.50	0.5	1.0	1.1	0.3	3.76	0.25	0.21	0.32	4.03	65.00	16.15
25.00	0.5	1.0	1.1	0.3	4.05	0.25	0.21	0.30	4.32	65.00	15.06
22.50	0.5	1.1	1.1	0.4	4.29	0.25	0.21	0.28	4.56	65.00	14.27
20.00	0.5	1.1	1.2	0.4	4.48	0.25	0.21	0.27	4.74	65.00	13.72
20.00	0.5	1.1	1.2	0.4	4.59	0.24	0.23	0.29	4.84	65.00	13.42
17.50	0.5	1.1	1.2	0.4	4.37	0.24	0.23	0.31	4.62	65.00	14.07
15.00	0.5	1.1	1.1	0.3	4.09	0.24	0.23	0.32	4.34	65.00	14.98
12.50	0.5	1.0	1.1	0.3	3.75	0.24	0.23	0.34	4.01	65.00	16.23
10.00	0.5	1.0	1.1	0.3	3.36	0.24	0.23	0.36	3.62	65.00	17.96
7.00	0.5	1.0	1.1	0.2	2.83	0.24	0.23	0.38	3.08	65.00	21.09
7.00	0.5	1.0	1.1	0.2	2.94	0.22	0.67	0.93	3.32	65.00	19.56
5.00	0.5	1.0	1.1	0.2	2.25	0.22	0.67	0.95	2.68	65.00	24.29
2.50	0.5	1.0	1.1	0.1	1.37	0.22	0.67	0.96	1.99	65.00	32.72
0.00	0.5	1.0	1.1	0.0	0.93	0.22	0.67	0.98	1.84	65.00	35.31

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.4	0.5	0.0	0.50	0.00	0.11	0.40	0.86	65.00	75.63
37.50	0.2	0.4	0.5	0.1	1.09	0.00	0.11	0.39	1.16	65.00	56.15
35.00	0.2	0.5	0.5	0.1	1.92	0.00	0.11	0.37	1.96	65.00	33.20
33.00	0.2	0.5	0.5	0.2	2.54	0.00	0.11	0.35	2.57	65.00	25.27
33.00	0.2	0.5	0.5	0.2	2.51	0.02	0.03	0.17	2.54	65.00	25.64
30.00	0.2	0.5	0.5	0.2	3.01	0.02	0.03	0.15	3.03	65.00	21.43
27.50	0.2	0.5	0.5	0.3	3.37	0.02	0.03	0.13	3.39	65.00	19.19
25.00	0.2	0.5	0.5	0.3	3.66	0.02	0.03	0.12	3.69	65.00	17.63
22.50	0.2	0.5	0.5	0.3	3.91	0.02	0.03	0.10	3.93	65.00	16.54
20.00	0.2	0.5	0.5	0.3	4.10	0.02	0.03	0.08	4.12	65.00	15.78
20.00	0.2	0.5	0.5	0.3	4.07	0.04	0.05	0.10	4.10	65.00	15.84
17.50	0.2	0.5	0.5	0.3	3.89	0.04	0.05	0.12	3.93	65.00	16.54
15.00	0.2	0.5	0.5	0.3	3.66	0.04	0.05	0.13	3.70	65.00	17.57
12.50	0.2	0.5	0.5	0.3	3.37	0.04	0.05	0.15	3.41	65.00	19.04
10.00	0.2	0.5	0.5	0.2	3.03	0.04	0.05	0.17	3.07	65.00	21.15
7.00	0.2	0.5	0.5	0.2	2.55	0.04	0.05	0.19	2.59	65.00	25.08
7.00	0.2	0.5	0.5	0.2	2.52	0.05	0.14	0.37	2.60	65.00	25.02
5.00	0.2	0.5	0.5	0.1	1.90	0.05	0.14	0.38	2.00	65.00	32.58
2.50	0.2	0.5	0.5	0.1	1.09	0.05	0.14	0.40	1.21	65.00	53.77
0.00	0.2	0.4	0.5	0.0	0.52	0.05	0.14	0.42	0.92	65.00	70.40

BY VALMONT INDUSTRIES FOR:
Design Id:Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.23	2.40	0.06	2.40	0.077		0.038	
	7.0000	0.23	2.40	0.06	2.40	0.077		0.038	
	20.0000	0.49	2.40	0.20	2.40	0.053		0.124	
	20.0000	0.49	2.40	0.20	2.40	0.053		0.124	
	33.0000	0.23	2.40	0.10	2.40	0.033		0.038	
	33.0000	0.23	2.40	0.10	2.40	0.033		0.038	
Arm 2	7.0000	0.10	2.40	0.20	2.40	0.332		0.043	
	20.0000	0.19	2.40	0.37	2.40	0.291		0.019	
	33.0000	0.10	2.40	0.20	2.40	0.332		0.043	
Arm 3	7.0000	0.07	2.40	0.18	2.40	0.268		0.032	
	7.0000	0.07	2.40	0.18	2.40	0.268		0.032	
	20.0000	0.13	2.40	0.34	2.40	0.240		0.011	
	20.0000	0.13	2.40	0.34	2.40	0.240		0.011	
	33.0000	0.07	2.40	0.18	2.40	0.268		0.032	
	33.0000	0.07	2.40	0.18	2.40	0.268		0.032	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item 35
Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	101	452	463	532
60.00	37	-6	37	0	102	676	684	838
55.00	84	-12	85	0	103	912	918	1161
50.00	146	-18	148	0	104	1161	1166	1500
48.00	176	-21	177	0	104	1264	1268	1641
48.00	176	-21	177	0	104	1264	1268	1641
45.00	224	-25	225	0	104	1423	1427	1963
45.00	227	-332	402	421	-2225	8235	8530	6540
40.00	729	-198	756	421	-2228	8505	8792	7101
35.00	1248	-64	1250	421	-2230	8788	9066	7687
32.00	1568	16	1568	421	-2230	8965	9238	8049
32.00	1481	16	1481	418	1356	10118	10208	10243
30.00	1726	-17	1726	418	1356	10238	10328	10489
30.00	1733	-17	1733	418	1355	10704	10789	10692
25.00	2384	-98	2386	418	1352	11004	11087	11335
21.25	2885	-159	2889	418	1353	11245	11326	11826
21.25	2863	-159	2867	455	948	12419	12455	13876
20.00	3050	-173	3055	455	946	12490	12526	14053
15.00	3809	-229	3816	455	943	12804	12839	14753
10.00	4588	-286	4597	455	939	13127	13161	15480
5.00	5386	-342	5397	455	936	13459	13491	16235
0.00	6205	-398	6217	455	936	13825	13857	16994

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	99	452	463	532
60.00	37	-6	37	0	99	676	684	838
55.00	84	-12	85	0	98	913	918	1161
50.00	147	-18	148	0	98	1161	1166	1500
48.00	176	-20	177	0	98	1264	1268	1641
48.00	176	-20	177	0	98	1264	1268	1641
45.00	224	-24	225	0	97	1423	1427	1963
45.00	227	482	533	-422	3932	8238	9128	7365
40.00	729	246	770	-422	3936	8508	9374	7926
35.00	1248	10	1248	-422	3938	8789	9631	8512
32.00	1568	-132	1574	-422	3938	8967	9793	8874
32.00	1482	-132	1487	-419	354	10120	10126	11071
30.00	1726	-140	1732	-419	354	10241	10247	11317
30.00	1733	-140	1739	-419	355	10705	10711	11520
25.00	2385	-162	2390	-419	357	11005	11010	12163
21.25	2885	-178	2891	-419	357	11245	11251	12654
21.25	2863	-178	2869	-456	762	12420	12443	14704
20.00	3050	-189	3056	-456	763	12490	12513	14881
15.00	3809	-235	3817	-456	764	12802	12825	15581
10.00	4588	-281	4597	-456	765	13124	13146	16308
5.00	5386	-327	5396	-456	766	13454	13476	17063
0.00	6204	-373	6215	-456	766	13821	13842	17822

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-421	-307	521	-3	-4576	6814	8208	2325
37.50	-219	-172	278	-3	-4452	6689	8035	2325
35.00	-20	-40	45	-3	-4329	6566	7864	2321
33.00	136	63	150	-3	-4229	6466	7727	2321
33.00	136	63	150	-1	-1566	2592	3029	2836
30.00	227	116	255	-1	-1416	2442	2823	2837
27.50	298	157	337	-1	-1292	2316	2652	2839
25.00	366	194	414	-1	-1167	2190	2481	2841
22.50	430	227	486	-1	-1042	2063	2311	2843
20.00	490	257	553	-1	-918	1938	2145	2843
20.00	490	257	553	1	1747	-1939	2610	3342
17.50	430	202	475	1	1871	-2063	2786	3342
15.00	366	144	393	1	1996	-2190	2964	3340
12.50	298	82	310	1	2121	-2317	3141	3338
10.00	227	17	228	1	2246	-2443	3318	3336
7.00	136	-67	152	1	2394	-2594	3530	3335
7.00	136	-67	152	3	5059	-6471	8213	3821
5.00	-20	-189	190	3	5158	-6570	8353	3821
2.50	-219	-346	409	3	5278	-6693	8524	3828
0.00	-422	-506	659	3	5402	-6818	8699	3828

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	3	0	3	86	-2183	1156	2470	-3591
37.50	36	64	73	86	-2059	1031	2303	-3590
35.00	65	124	140	86	-1935	907	2137	-3590
33.00	86	169	189	86	-1837	807	2006	-3589
33.00	86	169	189	29	-1039	697	1251	-3587
30.00	108	203	230	29	-890	548	1045	-3587
27.50	123	228	259	29	-767	424	876	-3586
25.00	134	250	283	29	-644	301	711	-3586
22.50	141	267	302	29	-521	177	551	-3585
20.00	144	281	316	29	-399	54	402	-3585
20.00	144	281	316	-29	399	-55	403	-3585
17.50	141	267	302	-29	521	-179	551	-3585
15.00	134	250	283	-29	644	-302	711	-3586
12.50	123	228	259	-29	767	-426	877	-3586
10.00	108	203	230	-29	890	-549	1046	-3587
7.00	86	169	189	-29	1039	-699	1252	-3587
7.00	86	169	189	-86	1837	-809	2007	-3589
5.00	65	124	140	-86	1935	-908	2138	-3590
2.50	36	64	73	-86	2059	-1032	2304	-3590
0.00	3	0	3	-86	2183	-1157	2471	-3591

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-37	0	37	22	-2045	1181	2361	399
37.50	-3	59	60	22	-1920	1057	2192	399
35.00	26	115	118	22	-1796	933	2024	400
33.00	48	157	164	22	-1697	833	1890	400
33.00	48	157	164	7	-997	708	1223	402
30.00	70	190	203	7	-848	559	1015	403
27.50	85	214	230	7	-723	435	844	403
25.00	96	234	253	7	-599	311	674	404
22.50	104	250	271	7	-474	187	509	404
20.00	108	262	283	7	-350	62	355	404
20.00	108	262	283	-7	350	-63	355	404
17.50	104	250	271	-7	474	-187	510	404
15.00	96	234	253	-7	599	-311	675	404
12.50	85	214	230	-7	723	-435	844	403
10.00	70	190	203	-7	848	-560	1016	403
7.00	47	157	164	-7	997	-709	1223	402
7.00	47	157	164	-22	1697	-834	1890	400
5.00	26	115	118	-22	1796	-933	2024	400
2.50	-4	59	60	-22	1920	-1058	2192	399
0.00	-37	0	37	-22	2045	-1182	2362	399

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.4	5.4	5.4	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.3	4.8	4.8	0.0	0.36	0.05	0.00	0.07	0.40	65.00	99.90
55.00	0.3	4.2	4.2	0.0	0.73	0.06	0.00	0.09	0.79	65.00	81.93
50.00	0.2	3.6	3.6	0.0	1.15	0.07	0.00	0.11	1.22	65.00	53.20
48.00	0.2	3.4	3.4	0.0	1.32	0.08	0.00	0.12	1.40	65.00	46.40
48.00	0.2	3.4	3.4	0.0	0.89	0.05	0.00	0.08	0.95	65.00	68.63
45.00	0.2	3.1	3.1	0.0	1.07	0.06	0.00	0.09	1.14	65.00	57.20
45.00	0.2	3.1	3.1	0.0	1.91	0.20	0.99	1.53	3.34	65.00	19.45
40.00	0.1	2.5	2.5	0.0	3.33	0.21	0.91	1.44	4.08	65.00	15.94
35.00	0.1	2.0	2.0	0.0	4.93	0.22	0.83	1.35	5.49	65.00	11.85
32.00	0.1	1.7	1.7	0.0	5.83	0.22	0.79	1.31	6.28	65.00	10.34
32.00	0.1	1.7	1.7	0.0	5.51	0.29	0.78	1.35	5.95	65.00	10.93
30.00	0.1	1.5	1.5	0.0	6.21	0.29	0.76	1.33	6.65	65.00	9.77
30.00	0.1	1.5	1.5	0.0	6.23	0.29	0.76	1.35	6.68	65.00	9.73
25.00	0.1	1.1	1.1	0.0	7.98	0.30	0.70	1.29	8.39	65.00	7.75
21.25	0.0	0.8	0.8	0.0	9.14	0.30	0.66	1.24	9.53	65.00	6.82
21.25	0.0	0.8	0.8	0.0	9.07	0.36	0.72	1.36	9.54	65.00	6.81
20.00	0.0	0.7	0.7	0.0	9.49	0.36	0.71	1.35	9.95	65.00	6.54
15.00	0.0	0.4	0.4	0.0	11.01	0.36	0.66	1.29	11.45	65.00	5.68
10.00	0.0	0.2	0.2	0.0	12.35	0.37	0.61	1.24	12.78	65.00	5.09
5.00	0.0	0.0	0.0	0.0	13.54	0.37	0.57	1.19	13.96	65.00	4.66
0.00	0.0	0.0	0.0	0.0	14.59	0.37	0.53	1.15	15.00	65.00	4.33

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	5.4	5.4	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.2	4.8	4.8	0.0	0.36	0.05	0.00	0.07	0.40	65.00	99.90
55.00	0.2	4.2	4.2	0.0	0.73	0.06	0.00	0.09	0.79	65.00	81.97
50.00	0.2	3.6	3.6	0.0	1.15	0.07	0.00	0.11	1.22	65.00	53.23
48.00	0.2	3.4	3.4	0.0	1.32	0.08	0.00	0.12	1.40	65.00	46.43
48.00	0.2	3.4	3.4	0.0	0.89	0.05	0.00	0.08	0.95	65.00	68.68
45.00	0.2	3.1	3.1	0.0	1.07	0.06	0.00	0.09	1.14	65.00	57.24
45.00	0.2	3.1	3.1	0.0	2.53	0.23	0.99	1.57	3.86	65.00	16.82
40.00	0.2	2.5	2.5	0.0	3.38	0.24	0.91	1.47	4.24	65.00	15.35
35.00	0.1	2.0	2.0	0.0	4.88	0.24	0.83	1.39	5.52	65.00	11.78
32.00	0.1	1.7	1.7	0.0	5.94	0.25	0.79	1.34	6.37	65.00	10.20
32.00	0.1	1.7	1.7	0.0	5.62	0.31	0.78	1.36	6.04	65.00	10.76
30.00	0.1	1.5	1.5	0.0	6.32	0.31	0.76	1.33	6.72	65.00	9.67
30.00	0.1	1.5	1.5	0.0	6.35	0.32	0.76	1.35	6.75	65.00	9.62
25.00	0.1	1.1	1.1	0.0	8.04	0.32	0.70	1.29	8.41	65.00	7.72
21.25	0.0	0.8	0.8	0.0	9.16	0.32	0.66	1.24	9.53	65.00	6.82
21.25	0.0	0.8	0.8	0.0	9.09	0.38	0.72	1.36	9.52	65.00	6.83
20.00	0.0	0.7	0.7	0.0	9.50	0.38	0.71	1.35	9.93	65.00	6.55
15.00	0.0	0.4	0.4	0.0	11.02	0.38	0.66	1.29	11.43	65.00	5.68
10.00	0.0	0.2	0.2	0.0	12.35	0.38	0.61	1.24	12.76	65.00	5.09
5.00	0.0	0.0	0.0	0.0	13.53	0.39	0.57	1.19	13.94	65.00	4.66
0.00	0.0	0.0	0.0	0.0	14.57	0.39	0.53	1.15	14.98	65.00	4.34

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	3.1	3.1	0.0	8.06	0.16	0.02	1.17	8.23	65.00	7.90
37.50	0.2	3.1	3.1	0.0	4.26	0.16	0.02	1.14	4.44	65.00	14.64
35.00	0.2	3.2	3.2	0.1	0.71	0.16	0.02	1.12	1.95	65.00	33.38
33.00	0.2	3.3	3.3	0.1	2.39	0.16	0.02	1.10	2.56	65.00	25.35
33.00	0.2	3.3	3.3	0.1	2.39	0.19	0.01	0.43	2.58	65.00	25.17
30.00	0.2	3.4	3.4	0.2	4.05	0.19	0.01	0.40	4.24	65.00	15.33
27.50	0.2	3.4	3.5	0.2	5.34	0.19	0.01	0.38	5.54	65.00	11.74
25.00	0.2	3.5	3.5	0.2	6.56	0.19	0.01	0.35	6.76	65.00	9.62
22.50	0.2	3.5	3.5	0.2	7.70	0.19	0.01	0.33	7.90	65.00	8.23
20.00	0.2	3.5	3.6	0.2	8.76	0.19	0.01	0.31	8.96	65.00	7.26
20.00	0.2	3.5	3.6	0.2	8.76	0.23	0.01	0.37	8.99	65.00	7.23
17.50	0.2	3.5	3.5	0.2	7.55	0.23	0.01	0.40	7.78	65.00	8.35
15.00	0.2	3.5	3.5	0.2	6.26	0.23	0.01	0.42	6.49	65.00	10.02
12.50	0.2	3.4	3.5	0.1	4.89	0.23	0.01	0.44	5.12	65.00	12.69
10.00	0.2	3.4	3.4	0.1	3.44	0.23	0.01	0.47	3.68	65.00	17.68
7.00	0.2	3.3	3.3	0.1	2.41	0.23	0.01	0.50	2.74	65.00	23.70
7.00	0.2	3.3	3.3	0.1	2.41	0.26	0.02	1.16	3.16	65.00	20.59
5.00	0.2	3.2	3.2	0.0	2.90	0.26	0.02	1.18	3.48	65.00	18.66
2.50	0.2	3.1	3.1	0.0	6.42	0.26	0.02	1.21	6.75	65.00	9.63
0.00	0.2	3.1	3.1	0.0	10.01	0.26	0.02	1.23	10.31	65.00	6.30

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.7	1.7	0.0	0.05	0.24	0.66	1.00	1.75	65.00	37.11
37.50	0.1	1.7	1.7	0.1	1.16	0.24	0.66	0.98	1.84	65.00	35.39
35.00	0.1	1.8	1.8	0.2	2.21	0.24	0.66	0.96	2.72	65.00	23.88
33.00	0.1	1.8	1.8	0.2	3.00	0.24	0.66	0.94	3.45	65.00	18.85
33.00	0.1	1.8	1.8	0.2	3.00	0.24	0.22	0.39	3.28	65.00	19.83
30.00	0.1	1.8	1.8	0.3	3.65	0.24	0.22	0.37	3.92	65.00	16.59
27.50	0.1	1.9	1.9	0.3	4.10	0.24	0.22	0.34	4.37	65.00	14.88
25.00	0.1	1.9	1.9	0.4	4.48	0.24	0.22	0.32	4.74	65.00	13.71
22.50	0.1	1.9	1.9	0.4	4.78	0.24	0.22	0.30	5.04	65.00	12.89
20.00	0.1	1.9	1.9	0.4	5.01	0.24	0.22	0.28	5.26	65.00	12.35
17.50	0.1	1.9	1.9	0.4	4.78	0.24	0.22	0.30	5.04	65.00	12.89
15.00	0.1	1.9	1.9	0.4	4.48	0.24	0.22	0.32	4.74	65.00	13.71
12.50	0.1	1.9	1.9	0.3	4.10	0.24	0.22	0.34	4.37	65.00	14.88
10.00	0.1	1.8	1.8	0.3	3.65	0.24	0.22	0.37	3.92	65.00	16.60
7.00	0.1	1.8	1.8	0.2	3.00	0.24	0.22	0.40	3.28	65.00	19.84
7.00	0.1	1.8	1.8	0.2	3.00	0.24	0.66	0.94	3.45	65.00	18.86
5.00	0.1	1.8	1.8	0.2	2.21	0.24	0.66	0.96	2.72	65.00	23.89
2.50	0.1	1.7	1.7	0.1	1.15	0.24	0.66	0.98	1.84	65.00	35.35
0.00	0.1	1.7	1.7	0.0	0.04	0.24	0.66	1.01	1.75	65.00	37.08

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	0.8	0.8	0.0	0.54	0.03	0.17	0.50	1.00	65.00	65.01
37.50	0.0	0.8	0.8	0.1	0.90	0.03	0.17	0.47	1.12	65.00	58.16
35.00	0.0	0.8	0.8	0.1	1.85	0.03	0.17	0.45	1.90	65.00	34.25
33.00	0.0	0.9	0.9	0.2	2.60	0.03	0.17	0.43	2.64	65.00	24.63
33.00	0.0	0.9	0.9	0.2	2.60	0.03	0.06	0.23	2.63	65.00	24.74
30.00	0.0	0.9	0.9	0.3	3.23	0.03	0.06	0.20	3.25	65.00	19.97
27.50	0.0	0.9	0.9	0.3	3.66	0.03	0.06	0.17	3.69	65.00	17.61
25.00	0.0	0.9	0.9	0.3	4.02	0.03	0.06	0.15	4.05	65.00	16.04
22.50	0.0	0.9	0.9	0.3	4.31	0.03	0.06	0.13	4.33	65.00	15.00
20.00	0.0	0.9	0.9	0.3	4.51	0.03	0.06	0.11	4.54	65.00	14.32
17.50	0.0	0.9	0.9	0.3	4.31	0.03	0.06	0.13	4.33	65.00	15.00
15.00	0.0	0.9	0.9	0.3	4.02	0.03	0.06	0.15	4.05	65.00	16.04
12.50	0.0	0.9	0.9	0.3	3.66	0.03	0.06	0.17	3.69	65.00	17.61
10.00	0.0	0.9	0.9	0.3	3.23	0.03	0.06	0.20	3.25	65.00	19.98
7.00	0.0	0.9	0.9	0.2	2.60	0.03	0.06	0.23	2.63	65.00	24.75
7.00	0.0	0.9	0.9	0.2	2.60	0.03	0.17	0.43	2.64	65.00	24.63
5.00	0.0	0.8	0.8	0.1	1.85	0.03	0.17	0.45	1.90	65.00	34.26
2.50	0.0	0.8	0.8	0.1	0.90	0.03	0.17	0.47	1.12	65.00	58.11
0.00	0.0	0.8	0.8	0.0	0.55	0.03	0.17	0.50	1.00	65.00	64.91

BY VALMONT INDUSTRIES FOR:
Design Id:Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.09	2.40	0.07	2.40	0.092		0.017	
	7.0000	0.09	2.40	0.07	2.40	0.092		0.017	
	20.0000	0.20	2.40	0.03	2.40	0.149		0.044	
	20.0000	0.20	2.40	0.03	2.40	0.149		0.044	
	33.0000	0.09	2.40	0.09	2.40	0.078		0.019	
	33.0000	0.09	2.40	0.09	2.40	0.078		0.019	
Arm 2	7.0000	0.03	2.40	0.20	2.40	0.137		0.007	
	20.0000	0.06	2.40	0.37	2.40	0.049		0.004	
	33.0000	0.03	2.40	0.20	2.40	0.136		0.012	
Arm 3	7.0000	0.01	2.40	0.18	2.40	0.128		0.004	
	7.0000	0.01	2.40	0.18	2.40	0.128		0.004	
	20.0000	0.03	2.40	0.34	2.40	0.063		0.002	
	20.0000	0.03	2.40	0.34	2.40	0.063		0.002	
	33.0000	0.02	2.40	0.18	2.40	0.128		0.006	
	33.0000	0.02	2.40	0.18	2.40	0.128		0.006	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	300	334	135
60.00	18	-18	26	0	369	301	476	441
55.00	36	-47	60	0	603	302	674	764
50.00	54	-91	106	0	849	302	902	1104
48.00	62	-113	128	0	951	303	998	1244
48.00	62	-113	128	0	951	303	998	1244
45.00	72	-150	166	0	1108	303	1149	1566
45.00	74	180	194	190	1385	3173	3462	661
40.00	264	89	279	190	1655	3174	3580	1218
35.00	455	-19	455	190	1938	3175	3720	1801
32.00	569	-92	576	190	2113	3176	3815	2163
32.00	484	-92	493	160	2949	3065	4253	4362
30.00	558	-164	581	160	3069	3065	4337	4608
30.00	558	-171	583	160	3539	3065	4681	4809
25.00	742	-393	839	160	3844	3065	4916	5443
21.25	880	-571	1049	160	4082	3065	5105	5934
21.25	865	-571	1036	143	4413	3047	5363	8008
20.00	911	-638	1112	143	4492	3046	5427	8177
15.00	1093	-917	1427	143	4820	3044	5701	8863
10.00	1276	-1217	1763	143	5159	3041	5989	9575
5.00	1458	-1537	2119	143	5509	3037	6291	10312
0.00	1641	-1878	2494	143	5875	3038	6614	11072

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	301	334	135
60.00	18	-18	26	0	369	302	476	441
55.00	36	-47	60	0	603	303	674	764
50.00	54	-91	106	0	849	304	902	1104
48.00	62	-113	128	0	951	304	998	1244
48.00	62	-113	128	0	951	304	998	1244
45.00	73	-150	166	0	1107	305	1148	1566
45.00	71	282	291	-182	2182	3140	3824	3856
40.00	260	143	297	-182	2453	3142	3986	4413
35.00	448	-12	448	-182	2737	3141	4166	4996
32.00	561	-114	573	-182	2912	3142	4284	5358
32.00	474	-114	487	-150	2818	3262	4311	7560
30.00	552	-183	581	-150	2938	3263	4391	7806
30.00	552	-190	584	-150	3408	3262	4717	8006
25.00	748	-404	850	-150	3714	3260	4942	8640
21.25	894	-576	1064	-150	3952	3261	5124	9131
21.25	877	-576	1049	-132	4354	3284	5454	11160
20.00	926	-642	1127	-132	4433	3281	5516	11328
15.00	1123	-918	1450	-132	4761	3277	5780	12014
10.00	1319	-1214	1793	-132	5099	3273	6059	12726
5.00	1516	-1531	2154	-132	5448	3267	6352	13464
0.00	1712	-1869	2534	-132	5814	3268	6669	14223

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-190	330	381	-1	906	2869	3009	-278
37.50	-104	301	318	-1	1031	2869	3048	-279
35.00	-18	268	268	-1	1156	2869	3093	-279
33.00	51	239	244	-1	1256	2868	3131	-279
33.00	51	241	246	-1	1050	970	1429	172
30.00	86	200	218	-1	1200	969	1543	172
27.50	115	162	199	-1	1325	969	1642	172
25.00	144	121	188	-1	1451	969	1744	172
22.50	173	75	188	-1	1576	968	1850	172
20.00	202	26	203	-1	1701	968	1957	172
20.00	202	28	204	-1	1496	-932	1762	622
17.50	174	-19	175	-1	1621	-932	1870	621
15.00	146	-69	161	-1	1746	-932	1980	621
12.50	118	-124	171	-1	1871	-933	2091	621
10.00	90	-182	203	-1	1996	-934	2204	622
7.00	56	-256	262	-1	2146	-934	2341	622
7.00	56	-254	260	-1	1941	-2834	3435	1070
5.00	-12	-302	302	-1	2040	-2835	3493	1071
2.50	-97	-365	378	-1	2165	-2835	3567	1073
0.00	-182	-432	469	-1	2289	-2835	3644	1073

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	31	0	31	85	-2198	-111	2201	-838
37.50	27	64	70	85	-2074	-112	2077	-837
35.00	24	124	127	85	-1949	-112	1952	-837
33.00	21	170	171	85	-1849	-113	1853	-837
33.00	40	170	175	27	-1050	-114	1056	-590
30.00	36	205	208	27	-900	-114	907	-589
27.50	33	230	232	27	-775	-114	784	-589
25.00	29	252	253	27	-651	-115	661	-588
22.50	26	269	270	27	-526	-115	538	-588
20.00	22	283	284	27	-401	-115	417	-588
20.00	41	283	286	-30	399	-116	415	-343
17.50	38	269	272	-30	524	-116	537	-343
15.00	34	252	254	-30	649	-117	659	-343
12.50	31	230	232	-30	774	-117	783	-344
10.00	27	205	207	-30	899	-117	907	-344
7.00	23	170	172	-30	1049	-117	1056	-345
7.00	42	170	175	-88	1850	-119	1854	-102
5.00	39	125	130	-88	1950	-119	1954	-102
2.50	35	64	73	-88	2075	-120	2079	-103
0.00	32	0	32	-88	2201	-121	2204	-103

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	17	0	17	15	-2073	-17	2073	-333
37.50	16	60	62	15	-1948	-18	1948	-332
35.00	15	117	118	15	-1823	-18	1823	-332
33.00	15	159	160	15	-1724	-18	1724	-332
33.00	19	156	157	4	-1024	-19	1024	-87
30.00	18	190	191	4	-874	-19	874	-87
27.50	18	214	215	4	-749	-19	750	-86
25.00	17	235	235	4	-624	-20	625	-86
22.50	16	252	252	4	-499	-20	500	-86
20.00	16	265	265	4	-374	-20	375	-85
20.00	19	261	262	-7	326	-21	326	158
17.50	19	249	250	-7	451	-21	451	158
15.00	18	234	235	-7	576	-21	576	157
12.50	18	215	216	-7	701	-22	702	157
10.00	17	192	193	-7	827	-22	827	156
7.00	16	159	160	-7	977	-22	977	156
7.00	20	156	157	-18	1678	-23	1678	397
5.00	19	114	116	-18	1778	-24	1778	397
2.50	19	59	62	-18	1903	-24	1903	396
0.00	18	0	18	-18	2029	-24	2029	396

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	1.6	2.0	0.0	0.03	0.01	0.00	0.04	0.08	65.00	99.90
60.00	1.1	1.4	1.8	0.0	0.25	0.02	0.00	0.05	0.27	65.00	99.90
55.00	0.9	1.2	1.5	0.0	0.51	0.04	0.00	0.07	0.55	65.00	99.90
50.00	0.8	1.0	1.3	0.0	0.81	0.05	0.00	0.09	0.86	65.00	75.34
48.00	0.8	1.0	1.3	0.0	0.94	0.06	0.00	0.10	1.00	65.00	64.89
48.00	0.8	1.0	1.3	0.0	0.64	0.04	0.00	0.06	0.68	65.00	96.00
45.00	0.7	0.9	1.1	0.0	0.79	0.05	0.00	0.07	0.84	65.00	77.64
45.00	0.7	0.9	1.1	0.0	0.93	0.02	0.45	0.67	1.47	65.00	44.31
40.00	0.6	0.7	0.9	0.0	1.23	0.04	0.41	0.63	1.53	65.00	42.50
35.00	0.5	0.6	0.8	0.0	1.79	0.05	0.38	0.59	1.93	65.00	33.61
32.00	0.4	0.5	0.6	0.0	2.20	0.06	0.36	0.57	2.32	65.00	28.07
32.00	0.4	0.5	0.6	0.0	1.89	0.12	0.30	0.54	2.03	65.00	31.97
30.00	0.4	0.4	0.6	0.0	2.16	0.13	0.29	0.53	2.30	65.00	28.22
30.00	0.4	0.4	0.6	0.0	2.17	0.13	0.29	0.55	2.31	65.00	28.13
25.00	0.3	0.3	0.4	0.0	2.80	0.14	0.27	0.53	2.95	65.00	22.01
21.25	0.2	0.2	0.3	0.0	3.32	0.15	0.25	0.52	3.49	65.00	18.63
21.25	0.2	0.2	0.3	0.0	3.28	0.21	0.23	0.50	3.50	65.00	18.57
20.00	0.2	0.2	0.3	0.0	3.47	0.21	0.22	0.50	3.69	65.00	17.60
15.00	0.1	0.1	0.2	0.0	4.19	0.22	0.21	0.49	4.41	65.00	14.74
10.00	0.1	0.0	0.1	0.0	4.83	0.23	0.19	0.48	5.06	65.00	12.84
5.00	0.0	0.0	0.0	0.0	5.42	0.23	0.18	0.47	5.66	65.00	11.49
0.00	0.0	0.0	0.0	0.0	5.95	0.24	0.17	0.46	6.20	65.00	10.48

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	1.6	2.0	0.0	0.03	0.01	0.00	0.04	0.08	65.00	99.90
60.00	1.1	1.4	1.8	0.0	0.25	0.02	0.00	0.05	0.27	65.00	99.90
55.00	0.9	1.2	1.6	0.0	0.51	0.04	0.00	0.07	0.55	65.00	99.90
50.00	0.8	1.1	1.4	0.0	0.81	0.05	0.00	0.09	0.86	65.00	75.31
48.00	0.8	1.0	1.3	0.0	0.94	0.06	0.00	0.10	1.00	65.00	64.92
48.00	0.8	1.0	1.3	0.0	0.64	0.04	0.00	0.06	0.68	65.00	96.04
45.00	0.7	0.9	1.2	0.0	0.79	0.05	0.00	0.07	0.84	65.00	77.66
45.00	0.7	0.9	1.2	0.0	1.40	0.12	0.43	0.67	1.90	65.00	34.19
40.00	0.6	0.7	1.0	0.0	1.27	0.13	0.39	0.63	1.76	65.00	36.84
35.00	0.5	0.6	0.8	0.0	1.76	0.14	0.36	0.60	2.11	65.00	30.78
32.00	0.4	0.5	0.7	0.0	2.19	0.15	0.34	0.58	2.47	65.00	26.30
32.00	0.4	0.5	0.7	0.0	1.87	0.21	0.28	0.52	2.18	65.00	29.75
30.00	0.4	0.4	0.6	0.0	2.16	0.21	0.27	0.51	2.46	65.00	26.42
30.00	0.4	0.4	0.6	0.0	2.16	0.22	0.27	0.53	2.48	65.00	26.17
25.00	0.3	0.3	0.4	0.0	2.83	0.23	0.25	0.51	3.14	65.00	20.72
21.25	0.2	0.2	0.3	0.0	3.36	0.23	0.24	0.50	3.62	65.00	17.93
21.25	0.2	0.2	0.3	0.0	3.32	0.29	0.21	0.49	3.63	65.00	17.89
20.00	0.2	0.2	0.3	0.0	3.52	0.29	0.20	0.49	3.83	65.00	16.98
15.00	0.1	0.1	0.2	0.0	4.25	0.29	0.19	0.47	4.56	65.00	14.24
10.00	0.1	0.1	0.1	0.0	4.91	0.30	0.18	0.47	5.23	65.00	12.43
5.00	0.0	0.0	0.0	0.0	5.51	0.31	0.17	0.46	5.83	65.00	11.14
0.00	0.0	0.0	0.0	0.0	6.06	0.31	0.15	0.45	6.38	65.00	10.18

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	0.9	1.1	0.0	6.00	0.02	0.01	0.43	6.05	65.00	10.75
37.50	0.7	0.9	1.2	0.0	5.05	0.02	0.01	0.43	5.10	65.00	12.75
35.00	0.7	0.9	1.2	0.1	4.05	0.02	0.01	0.44	4.10	65.00	15.86
33.00	0.7	1.0	1.2	0.1	3.82	0.02	0.01	0.45	3.91	65.00	16.63
33.00	0.7	1.0	1.2	0.1	3.85	0.01	0.01	0.21	3.87	65.00	16.78
30.00	0.7	1.0	1.2	0.1	3.46	0.01	0.01	0.23	3.49	65.00	18.61
27.50	0.7	1.0	1.3	0.1	3.08	0.01	0.01	0.24	3.12	65.00	20.86
25.00	0.7	1.1	1.3	0.1	2.85	0.01	0.01	0.25	2.89	65.00	22.48
22.50	0.7	1.1	1.3	0.1	3.00	0.01	0.01	0.27	3.04	65.00	21.35
20.00	0.7	1.1	1.3	0.0	3.13	0.01	0.01	0.28	3.17	65.00	20.48
20.00	0.7	1.1	1.3	0.0	3.14	0.04	0.01	0.26	3.19	65.00	20.37
17.50	0.7	1.1	1.3	0.0	2.67	0.04	0.01	0.27	2.75	65.00	23.62
15.00	0.7	1.1	1.3	0.0	2.57	0.04	0.01	0.29	2.65	65.00	24.49
12.50	0.7	1.0	1.3	0.0	2.53	0.04	0.01	0.30	2.61	65.00	24.94
10.00	0.7	1.0	1.3	-0.1	3.22	0.04	0.01	0.32	3.28	65.00	19.79
7.00	0.7	1.0	1.2	-0.1	4.11	0.04	0.01	0.34	4.17	65.00	15.58
7.00	0.7	1.0	1.2	-0.1	4.08	0.07	0.01	0.49	4.23	65.00	15.35
5.00	0.7	1.0	1.2	-0.1	4.51	0.07	0.01	0.50	4.61	65.00	14.11
2.50	0.7	0.9	1.2	0.0	5.96	0.07	0.01	0.51	6.05	65.00	10.75
0.00	0.7	0.9	1.2	0.0	7.46	0.07	0.01	0.52	7.54	65.00	8.62

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	0.5	0.6	0.0	0.45	0.06	0.65	0.96	1.70	65.00	38.16
37.50	0.4	0.5	0.7	0.1	1.11	0.06	0.65	0.94	1.76	65.00	36.97
35.00	0.4	0.5	0.7	0.1	1.97	0.06	0.65	0.92	2.33	65.00	27.85
33.00	0.4	0.5	0.7	0.2	2.63	0.06	0.65	0.91	2.89	65.00	22.49
33.00	0.4	0.5	0.7	0.2	2.74	0.04	0.21	0.36	2.79	65.00	23.27
30.00	0.4	0.5	0.7	0.3	3.23	0.04	0.21	0.34	3.28	65.00	19.80
27.50	0.4	0.5	0.7	0.3	3.58	0.04	0.21	0.32	3.63	65.00	17.90
25.00	0.4	0.5	0.7	0.3	3.88	0.04	0.21	0.30	3.93	65.00	16.56
22.50	0.4	0.5	0.7	0.4	4.11	0.04	0.21	0.28	4.16	65.00	15.61
20.00	0.4	0.5	0.7	0.4	4.30	0.04	0.21	0.27	4.35	65.00	14.95
20.00	0.4	0.5	0.7	0.4	4.41	0.02	0.23	0.29	4.45	65.00	14.60
17.50	0.4	0.5	0.7	0.4	4.19	0.02	0.23	0.31	4.23	65.00	15.38
15.00	0.4	0.5	0.7	0.3	3.91	0.02	0.23	0.32	3.95	65.00	16.46
12.50	0.4	0.5	0.7	0.3	3.57	0.02	0.23	0.34	3.61	65.00	17.99
10.00	0.4	0.5	0.7	0.3	3.18	0.02	0.23	0.36	3.22	65.00	20.16
7.00	0.4	0.5	0.7	0.2	2.64	0.02	0.23	0.38	2.68	65.00	24.21
7.00	0.4	0.5	0.7	0.2	2.75	0.01	0.67	0.93	3.04	65.00	21.35
5.00	0.4	0.5	0.7	0.1	2.07	0.01	0.67	0.95	2.45	65.00	26.56
2.50	0.4	0.5	0.7	0.1	1.16	0.01	0.67	0.96	1.85	65.00	35.07
0.00	0.4	0.5	0.7	0.0	0.47	0.01	0.67	0.98	1.76	65.00	36.92

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.2	0.3	0.0	0.24	0.02	0.11	0.40	0.73	65.00	88.83
37.50	0.2	0.2	0.3	0.1	0.98	0.02	0.11	0.39	1.03	65.00	62.88
35.00	0.2	0.2	0.3	0.1	1.81	0.02	0.11	0.37	1.84	65.00	35.42
33.00	0.2	0.2	0.3	0.2	2.44	0.02	0.11	0.35	2.46	65.00	26.44
33.00	0.2	0.2	0.3	0.2	2.40	0.01	0.03	0.17	2.41	65.00	26.98
30.00	0.2	0.2	0.3	0.2	2.90	0.01	0.03	0.15	2.91	65.00	22.36
27.50	0.2	0.2	0.3	0.3	3.26	0.01	0.03	0.13	3.26	65.00	19.93
25.00	0.2	0.2	0.3	0.3	3.55	0.01	0.03	0.12	3.56	65.00	18.26
22.50	0.2	0.2	0.3	0.3	3.80	0.01	0.03	0.10	3.80	65.00	17.08
20.00	0.2	0.2	0.3	0.3	3.99	0.01	0.03	0.08	3.99	65.00	16.28
20.00	0.2	0.2	0.3	0.3	3.96	0.01	0.05	0.10	3.97	65.00	16.38
17.50	0.2	0.2	0.3	0.3	3.78	0.01	0.05	0.12	3.79	65.00	17.14
15.00	0.2	0.2	0.3	0.3	3.55	0.01	0.05	0.13	3.56	65.00	18.24
12.50	0.2	0.2	0.3	0.3	3.26	0.01	0.05	0.15	3.28	65.00	19.82
10.00	0.2	0.2	0.3	0.2	2.92	0.01	0.05	0.17	2.94	65.00	22.12
7.00	0.2	0.2	0.3	0.2	2.44	0.01	0.05	0.19	2.46	65.00	26.44
7.00	0.2	0.2	0.3	0.2	2.41	0.03	0.14	0.37	2.47	65.00	26.36
5.00	0.2	0.2	0.3	0.1	1.80	0.03	0.14	0.38	1.87	65.00	34.85
2.50	0.2	0.2	0.3	0.1	0.98	0.03	0.14	0.40	1.09	65.00	59.86
0.00	0.2	0.2	0.3	0.0	0.26	0.03	0.14	0.42	0.78	65.00	83.12

BY VALMONT INDUSTRIES FOR:
Design Id:Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.14	2.40	0.01	2.40	0.026		0.020	
	7.0000	0.14	2.40	0.01	2.40	0.026		0.020	
	20.0000	0.29	2.40	0.03	2.40	0.034		0.077	
	20.0000	0.29	2.40	0.03	2.40	0.034		0.077	
	33.0000	0.14	2.40	0.03	2.40	0.012		0.020	
	33.0000	0.14	2.40	0.03	2.40	0.012		0.020	
Arm 2	7.0000	0.07	2.40	0.20	2.40	0.242		0.033	
	20.0000	0.14	2.40	0.37	2.40	0.191		0.012	
	33.0000	0.07	2.40	0.20	2.40	0.242		0.033	
Arm 3	7.0000	0.05	2.40	0.18	2.40	0.205		0.026	
	7.0000	0.05	2.40	0.18	2.40	0.205		0.026	
	20.0000	0.10	2.40	0.34	2.40	0.169		0.008	
	20.0000	0.10	2.40	0.34	2.40	0.169		0.008	
	33.0000	0.05	2.40	0.18	2.40	0.205		0.026	
	33.0000	0.05	2.40	0.18	2.40	0.205		0.026	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	101	347	362	134
60.00	30	-6	31	0	101	571	580	440
55.00	72	-12	73	0	101	807	813	763
50.00	128	-18	129	0	102	1054	1059	1102
48.00	154	-21	155	0	102	1157	1161	1243
48.00	154	-21	155	0	102	1157	1161	1243
45.00	199	-24	200	0	102	1315	1319	1565
45.00	201	10	202	232	316	5230	5240	1892
40.00	523	-9	524	232	315	5503	5512	2451
35.00	862	-28	863	232	315	5787	5796	3036
32.00	1074	-40	1074	232	315	5964	5972	3397
32.00	987	-40	988	261	769	7118	7160	5593
30.00	1160	-58	1161	261	769	7239	7279	5839
30.00	1167	-58	1168	261	769	7707	7745	6040
25.00	1638	-104	1642	261	768	8012	8049	6678
21.25	2004	-139	2009	261	768	8252	8287	7169
21.25	1982	-139	1987	315	733	9427	9455	9218
20.00	2124	-150	2130	315	732	9503	9531	9390
15.00	2704	-193	2711	315	730	9826	9853	10083
10.00	3304	-237	3313	315	729	10159	10185	10802
5.00	3924	-281	3935	315	727	10502	10527	11547
0.00	4566	-324	4577	315	727	10868	10892	12307

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	100	348	362	134
60.00	30	-6	31	0	99	571	580	440
55.00	72	-12	73	0	99	807	813	763
50.00	128	-18	129	0	99	1055	1059	1102
48.00	154	-20	155	0	99	1157	1161	1243
48.00	154	-20	155	0	99	1157	1161	1243
45.00	199	-24	200	0	99	1315	1319	1565
45.00	201	110	229	-232	1086	5232	5344	2589
40.00	524	44	525	-232	1087	5504	5611	3148
35.00	862	-21	863	-232	1088	5788	5889	3733
32.00	1074	-60	1076	-232	1088	5965	6063	4094
32.00	987	-60	989	-261	635	7120	7148	6290
30.00	1160	-75	1162	-261	635	7240	7268	6537
30.00	1167	-75	1169	-261	636	7708	7734	6737
25.00	1639	-113	1642	-261	636	8013	8038	7375
21.25	2005	-142	2010	-261	636	8252	8277	7866
21.25	1982	-142	1988	-316	672	9427	9451	9915
20.00	2124	-152	2130	-316	673	9503	9527	10087
15.00	2705	-193	2711	-316	673	9825	9848	10780
10.00	3304	-233	3313	-316	674	10157	10180	11499
5.00	3924	-274	3934	-316	674	10499	10521	12245
0.00	4565	-314	4576	-316	674	10865	10886	13004

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-232	34	235	-3	-326	3916	3929	-215
37.50	-116	42	124	-3	-202	3792	3797	-215
35.00	-5	46	46	-3	-78	3667	3668	-215
33.00	82	47	95	-3	22	3568	3568	-215
33.00	82	47	95	-1	-191	1620	1631	188
30.00	138	51	147	-1	-42	1471	1472	189
27.50	180	50	187	-1	82	1347	1349	189
25.00	219	46	223	-1	207	1223	1240	189
22.50	253	38	256	-1	331	1098	1147	190
20.00	285	26	286	-1	455	974	1075	190
20.00	285	26	286	1	242	-974	1004	590
17.50	253	17	254	1	367	-1099	1158	590
15.00	219	4	219	1	491	-1223	1318	589
12.50	180	-12	181	1	615	-1348	1481	589
10.00	138	-33	142	1	739	-1472	1647	588
7.00	82	-62	103	1	889	-1621	1849	588
7.00	82	-62	103	3	676	-3570	3634	985
5.00	-5	-79	80	3	775	-3670	3751	985
2.50	-117	-105	157	3	899	-3794	3899	986
0.00	-232	-133	268	3	1023	-3918	4049	986

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-29	0	29	86	-2193	1155	2479	-459
37.50	4	64	64	86	-2069	1031	2311	-459
35.00	33	124	128	86	-1945	907	2146	-458
33.00	54	170	178	86	-1845	807	2014	-457
33.00	54	170	178	29	-1046	698	1258	-455
30.00	76	205	218	29	-897	550	1052	-455
27.50	91	230	247	29	-772	426	882	-454
25.00	102	251	271	29	-648	302	715	-454
22.50	109	268	290	29	-524	178	553	-453
20.00	112	282	304	29	-400	54	403	-453
20.00	112	282	304	-29	400	-54	403	-453
17.50	109	268	290	-29	524	-178	553	-453
15.00	102	251	271	-29	648	-302	715	-454
12.50	91	230	247	-29	772	-426	882	-454
10.00	76	205	218	-29	897	-550	1052	-455
7.00	54	170	178	-29	1046	-699	1258	-455
7.00	53	170	178	-86	1845	-808	2014	-457
5.00	33	124	128	-86	1945	-907	2146	-458
2.50	4	64	64	-86	2069	-1032	2312	-459
0.00	-29	0	29	-86	2193	-1156	2479	-459

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-55	0	55	22	-2046	1178	2361	30
37.50	-21	60	63	22	-1921	1054	2191	30
35.00	9	115	116	22	-1797	930	2023	31
33.00	30	157	160	22	-1697	830	1889	31
33.00	30	157	160	7	-998	706	1222	33
30.00	53	190	198	7	-848	557	1015	34
27.50	67	214	224	7	-724	434	844	34
25.00	79	234	247	7	-599	310	674	35
22.50	86	250	264	7	-474	186	509	35
20.00	90	262	277	7	-350	62	355	35
20.00	90	262	277	-7	350	-62	355	35
17.50	86	250	264	-7	474	-186	510	35
15.00	79	234	247	-7	599	-310	674	35
12.50	67	214	224	-7	724	-434	844	34
10.00	53	190	198	-7	848	-557	1015	34
7.00	30	157	160	-7	998	-706	1222	33
7.00	30	157	160	-22	1697	-831	1890	31
5.00	9	115	116	-22	1797	-930	2023	31
2.50	-21	60	63	-22	1921	-1054	2191	30
0.00	-55	0	55	-22	2046	-1178	2361	30

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.3	3.8	3.8	0.0	0.03	0.01	0.00	0.04	0.07	65.00	99.90
60.00	0.2	3.4	3.4	0.0	0.30	0.02	0.00	0.06	0.32	65.00	99.90
55.00	0.2	3.0	3.0	0.0	0.63	0.04	0.00	0.08	0.67	65.00	97.45
50.00	0.2	2.6	2.6	0.0	1.00	0.05	0.00	0.10	1.06	65.00	61.44
48.00	0.2	2.4	2.4	0.0	1.16	0.06	0.00	0.11	1.22	65.00	53.10
48.00	0.2	2.4	2.4	0.0	0.79	0.04	0.00	0.08	0.83	65.00	78.54
45.00	0.1	2.2	2.2	0.0	0.96	0.05	0.00	0.08	1.01	65.00	64.67
45.00	0.1	2.2	2.2	0.0	0.95	0.06	0.55	0.88	1.53	65.00	42.57
40.00	0.1	1.8	1.8	0.0	2.24	0.07	0.50	0.83	2.51	65.00	25.89
35.00	0.1	1.4	1.4	0.0	3.39	0.09	0.46	0.79	3.60	65.00	18.08
32.00	0.1	1.2	1.2	0.0	4.02	0.09	0.44	0.77	4.21	65.00	15.45
32.00	0.1	1.2	1.2	0.0	3.70	0.16	0.49	0.89	3.97	65.00	16.37
30.00	0.1	1.1	1.1	0.0	4.21	0.16	0.47	0.87	4.47	65.00	14.53
30.00	0.1	1.1	1.1	0.0	4.24	0.17	0.47	0.90	4.50	65.00	14.43
25.00	0.1	0.8	0.8	0.0	5.52	0.18	0.44	0.86	5.76	65.00	11.29
21.25	0.0	0.6	0.6	0.0	6.38	0.18	0.41	0.84	6.61	65.00	9.83
21.25	0.0	0.6	0.6	0.0	6.31	0.24	0.50	0.99	6.62	65.00	9.82
20.00	0.0	0.5	0.5	0.0	6.63	0.24	0.49	0.98	6.94	65.00	9.36
15.00	0.0	0.3	0.3	0.0	7.84	0.25	0.45	0.94	8.14	65.00	7.98
10.00	0.0	0.1	0.1	0.0	8.92	0.25	0.42	0.91	9.22	65.00	7.05
5.00	0.0	0.0	0.0	0.0	9.88	0.26	0.39	0.88	10.18	65.00	6.38
0.00	0.0	0.0	0.0	0.0	10.75	0.27	0.37	0.85	11.05	65.00	5.88

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	3.8	3.8	0.0	0.03	0.01	0.00	0.04	0.07	65.00	99.90
60.00	0.2	3.4	3.4	0.0	0.30	0.02	0.00	0.06	0.32	65.00	99.90
55.00	0.2	3.0	3.0	0.0	0.63	0.04	0.00	0.08	0.67	65.00	97.47
50.00	0.2	2.6	2.6	0.0	1.00	0.05	0.00	0.10	1.06	65.00	61.46
48.00	0.2	2.4	2.4	0.0	1.16	0.06	0.00	0.11	1.22	65.00	53.11
48.00	0.2	2.4	2.4	0.0	0.79	0.04	0.00	0.08	0.83	65.00	78.57
45.00	0.1	2.2	2.2	0.0	0.96	0.05	0.00	0.08	1.00	65.00	64.69
45.00	0.1	2.2	2.2	0.0	1.08	0.08	0.55	0.88	1.83	65.00	35.43
40.00	0.1	1.8	1.8	0.0	2.28	0.09	0.50	0.84	2.62	65.00	24.76
35.00	0.1	1.4	1.4	0.0	3.38	0.11	0.46	0.80	3.60	65.00	18.04
32.00	0.1	1.2	1.2	0.0	4.04	0.11	0.44	0.78	4.21	65.00	15.42
32.00	0.1	1.2	1.2	0.0	3.72	0.18	0.49	0.89	3.96	65.00	16.40
30.00	0.1	1.1	1.1	0.0	4.23	0.18	0.47	0.88	4.47	65.00	14.55
30.00	0.1	1.1	1.1	0.0	4.26	0.18	0.47	0.90	4.49	65.00	14.46
25.00	0.1	0.8	0.8	0.0	5.52	0.19	0.44	0.86	5.75	65.00	11.30
21.25	0.0	0.6	0.6	0.0	6.38	0.20	0.41	0.84	6.61	65.00	9.84
21.25	0.0	0.6	0.6	0.0	6.31	0.25	0.50	0.99	6.60	65.00	9.85
20.00	0.0	0.5	0.5	0.0	6.63	0.26	0.49	0.98	6.92	65.00	9.39
15.00	0.0	0.3	0.3	0.0	7.84	0.26	0.45	0.94	8.13	65.00	8.00
10.00	0.0	0.1	0.1	0.0	8.92	0.27	0.42	0.91	9.20	65.00	7.06
5.00	0.0	0.0	0.0	0.0	9.88	0.28	0.40	0.88	10.17	65.00	6.39
0.00	0.0	0.0	0.0	0.0	10.75	0.29	0.37	0.85	11.04	65.00	5.89

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	2.2	2.2	0.0	3.62	0.01	0.02	0.57	3.65	65.00	17.79
37.50	0.1	2.2	2.2	0.0	1.97	0.01	0.02	0.55	2.01	65.00	32.28
35.00	0.1	2.3	2.3	0.0	0.71	0.01	0.02	0.53	1.14	65.00	57.09
33.00	0.1	2.3	2.3	0.0	1.49	0.01	0.02	0.52	1.54	65.00	42.30
33.00	0.1	2.3	2.3	0.0	1.49	0.01	0.01	0.23	1.51	65.00	43.02
30.00	0.1	2.4	2.4	0.0	2.34	0.01	0.01	0.21	2.35	65.00	27.62
27.50	0.1	2.4	2.4	0.0	2.95	0.01	0.01	0.20	2.97	65.00	21.88
25.00	0.1	2.5	2.5	0.0	3.49	0.01	0.01	0.18	3.51	65.00	18.51
22.50	0.1	2.5	2.5	0.0	3.96	0.01	0.01	0.17	3.97	65.00	16.35
20.00	0.1	2.5	2.5	0.0	4.34	0.01	0.01	0.16	4.36	65.00	14.91
20.00	0.1	2.5	2.5	0.0	4.34	0.04	0.01	0.15	4.38	65.00	14.83
17.50	0.1	2.5	2.5	0.0	3.83	0.04	0.01	0.17	3.87	65.00	16.80
15.00	0.1	2.5	2.5	0.0	3.24	0.04	0.01	0.19	3.28	65.00	19.82
12.50	0.1	2.4	2.4	0.0	2.72	0.04	0.01	0.21	2.77	65.00	23.43
10.00	0.1	2.4	2.4	0.0	2.22	0.04	0.01	0.24	2.28	65.00	28.47
7.00	0.1	2.3	2.3	0.0	1.58	0.04	0.01	0.26	1.66	65.00	39.18
7.00	0.1	2.3	2.3	0.0	1.58	0.07	0.02	0.53	1.71	65.00	38.01
5.00	0.1	2.3	2.3	0.0	1.20	0.07	0.02	0.54	1.50	65.00	43.35
2.50	0.1	2.2	2.2	0.0	2.35	0.07	0.02	0.56	2.43	65.00	26.80
0.00	0.1	2.2	2.2	0.0	4.23	0.07	0.02	0.59	4.30	65.00	15.13

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.2	1.2	0.0	0.42	0.03	0.66	1.01	1.80	65.00	36.11
37.50	0.1	1.2	1.2	0.1	0.96	0.03	0.66	0.98	1.83	65.00	35.50
35.00	0.1	1.3	1.3	0.1	2.03	0.03	0.66	0.96	2.37	65.00	27.48
33.00	0.1	1.3	1.3	0.2	2.82	0.03	0.66	0.94	3.08	65.00	21.13
33.00	0.1	1.3	1.3	0.2	2.82	0.03	0.22	0.40	2.88	65.00	22.54
30.00	0.1	1.3	1.3	0.3	3.47	0.03	0.22	0.37	3.53	65.00	18.43
27.50	0.1	1.3	1.3	0.3	3.93	0.03	0.22	0.34	3.98	65.00	16.34
25.00	0.1	1.3	1.3	0.3	4.31	0.03	0.22	0.32	4.36	65.00	14.92
22.50	0.1	1.4	1.4	0.4	4.61	0.03	0.22	0.30	4.66	65.00	13.96
20.00	0.1	1.4	1.4	0.4	4.83	0.03	0.22	0.28	4.88	65.00	13.33
20.00	0.1	1.4	1.4	0.4	4.83	0.03	0.22	0.28	4.88	65.00	13.32
17.50	0.1	1.4	1.4	0.4	4.61	0.03	0.22	0.30	4.66	65.00	13.96
15.00	0.1	1.3	1.3	0.3	4.31	0.03	0.22	0.32	4.36	65.00	14.92
12.50	0.1	1.3	1.3	0.3	3.93	0.03	0.22	0.34	3.98	65.00	16.34
10.00	0.1	1.3	1.3	0.3	3.47	0.03	0.22	0.37	3.53	65.00	18.43
7.00	0.1	1.3	1.3	0.2	2.82	0.03	0.22	0.40	2.88	65.00	22.54
7.00	0.1	1.3	1.3	0.2	2.82	0.03	0.66	0.94	3.08	65.00	21.13
5.00	0.1	1.3	1.3	0.1	2.02	0.03	0.66	0.96	2.37	65.00	27.48
2.50	0.1	1.2	1.2	0.1	0.96	0.03	0.66	0.98	1.83	65.00	35.48
0.00	0.1	1.2	1.2	0.0	0.43	0.03	0.66	1.01	1.80	65.00	36.08

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	0.6	0.6	0.0	0.80	0.00	0.17	0.50	1.17	65.00	55.51
37.50	0.0	0.6	0.6	0.1	1.00	0.00	0.17	0.47	1.22	65.00	53.14
35.00	0.0	0.6	0.6	0.1	1.75	0.00	0.17	0.45	1.78	65.00	36.59
33.00	0.0	0.6	0.6	0.2	2.49	0.00	0.17	0.43	2.51	65.00	25.89
33.00	0.0	0.6	0.6	0.2	2.49	0.00	0.06	0.23	2.50	65.00	26.05
30.00	0.0	0.6	0.6	0.2	3.12	0.00	0.06	0.20	3.12	65.00	20.82
27.50	0.0	0.7	0.7	0.3	3.56	0.00	0.06	0.17	3.56	65.00	18.26
25.00	0.0	0.7	0.7	0.3	3.92	0.00	0.06	0.15	3.92	65.00	16.59
22.50	0.0	0.7	0.7	0.3	4.20	0.00	0.06	0.13	4.20	65.00	15.47
20.00	0.0	0.7	0.7	0.3	4.40	0.00	0.06	0.11	4.41	65.00	14.75
17.50	0.0	0.7	0.7	0.3	4.20	0.00	0.06	0.13	4.20	65.00	15.47
15.00	0.0	0.7	0.7	0.3	3.92	0.00	0.06	0.15	3.92	65.00	16.59
12.50	0.0	0.7	0.7	0.3	3.56	0.00	0.06	0.17	3.56	65.00	18.26
10.00	0.0	0.6	0.6	0.2	3.12	0.00	0.06	0.20	3.12	65.00	20.82
7.00	0.0	0.6	0.6	0.2	2.49	0.00	0.06	0.23	2.49	65.00	26.05
7.00	0.0	0.6	0.6	0.2	2.49	0.00	0.17	0.43	2.51	65.00	25.89
5.00	0.0	0.6	0.6	0.1	1.75	0.00	0.17	0.45	1.78	65.00	36.60
2.50	0.0	0.6	0.6	0.1	1.00	0.00	0.17	0.47	1.22	65.00	53.11
0.00	0.0	0.6	0.6	0.0	0.80	0.00	0.17	0.50	1.17	65.00	55.45

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	705	201	733	1634
60.00	12	-42	44	0	705	202	733	1940
55.00	24	-85	88	0	706	202	734	2263
50.00	36	-127	132	0	706	202	735	2603
48.00	41	-144	150	0	707	202	735	2743
48.00	41	-144	150	0	707	202	735	2743
45.00	48	-169	176	0	707	202	736	3066
45.00	48	-550	552	49	-2794	960	2954	11039
40.00	106	-382	397	49	-2793	961	2953	11597
35.00	164	-214	270	49	-2796	959	2956	12178
32.00	198	-114	229	49	-2795	960	2955	12540
32.00	112	-114	160	41	4271	959	4378	14728
30.00	135	-216	255	41	4272	959	4378	14974
30.00	135	-216	255	41	4271	959	4377	15175
25.00	192	-473	510	41	4269	958	4375	15808
21.25	236	-665	705	41	4270	958	4376	16300
21.25	219	-665	700	37	3441	959	3572	18352
20.00	234	-716	753	37	3438	958	3568	18520
15.00	291	-923	967	37	3432	956	3563	19204
10.00	349	-1128	1181	37	3426	954	3556	19915
5.00	406	-1334	1394	37	3419	952	3549	20650
0.00	463	-1539	1607	37	3419	952	3549	21409

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	703	202	731	1635
60.00	12	-42	44	0	703	202	732	1941
55.00	24	-84	88	0	704	202	732	2264
50.00	36	-127	132	0	704	202	732	2603
48.00	41	-144	149	0	704	202	733	2744
48.00	41	-144	149	0	704	202	732	2744
45.00	49	-169	176	0	704	203	733	3066
45.00	48	1045	1046	-50	9342	962	9392	14486
40.00	106	484	496	-50	9343	962	9393	15043
35.00	164	-77	181	-50	9349	960	9399	15622
32.00	198	-413	458	-50	9350	960	9399	15984
32.00	112	-413	428	-41	2290	960	2484	18199
30.00	135	-468	487	-41	2291	960	2484	18445
30.00	135	-468	487	-41	2288	960	2481	18646
25.00	193	-606	636	-41	2285	959	2478	19279
21.25	236	-708	747	-41	2286	959	2479	19771
21.25	220	-708	742	-37	3116	959	3260	21821
20.00	234	-755	791	-37	3112	958	3256	21988
15.00	291	-942	986	-37	3105	956	3249	22673
10.00	349	-1128	1181	-37	3098	953	3241	23383
5.00	406	-1314	1375	-37	3090	951	3232	24118
0.00	463	-1500	1569	-37	3090	951	3233	24877

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-49	-380	383	0	-7975	758	8011	3497
37.50	-27	-143	145	0	-7850	758	7887	3498
35.00	-4	91	91	0	-7726	758	7763	3496
33.00	14	275	275	0	-7625	758	7663	3497
33.00	14	275	275	0	-1828	254	1846	5214
30.00	23	338	339	0	-1675	254	1694	5215
27.50	31	386	388	0	-1546	253	1567	5216
25.00	39	431	433	0	-1417	253	1440	5218
22.50	46	472	474	0	-1288	252	1313	5219
20.00	54	508	511	0	-1163	252	1190	5219
20.00	54	508	511	0	4643	-253	4650	6912
17.50	46	367	370	0	4768	-253	4775	6912
15.00	39	222	226	0	4897	-253	4904	6909
12.50	31	73	80	0	5025	-254	5031	6906
10.00	23	-79	83	0	5150	-255	5156	6906
7.00	14	-267	268	0	5300	-255	5306	6906
7.00	14	-267	268	0	11099	-760	11125	8598
5.00	-4	-535	535	0	11192	-760	11218	8607
2.50	-27	-873	873	0	11304	-760	11330	8624
0.00	-50	-1214	1215	0	11429	-760	11455	8624

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	8	0	8	86	-2184	0	2184	-7068
37.50	8	64	64	86	-2059	0	2059	-7068
35.00	8	124	124	86	-1935	-1	1935	-7067
33.00	8	169	169	86	-1835	-1	1835	-7067
33.00	8	169	169	29	-1037	-1	1037	-7065
30.00	8	203	204	29	-887	-1	887	-7064
27.50	8	228	228	29	-765	-1	765	-7064
25.00	8	249	250	29	-642	-1	642	-7064
22.50	8	267	267	29	-520	-1	520	-7063
20.00	8	281	281	29	-398	0	398	-7063
20.00	8	281	281	-29	398	0	398	-7063
17.50	8	267	267	-29	520	0	520	-7063
15.00	8	249	250	-29	642	0	642	-7064
12.50	8	228	228	-29	765	0	765	-7064
10.00	8	203	204	-29	887	0	887	-7064
7.00	8	169	169	-29	1037	0	1037	-7065
7.00	8	169	169	-86	1835	0	1835	-7067
5.00	8	124	124	-86	1935	0	1935	-7067
2.50	8	64	64	-86	2059	0	2059	-7068
0.00	8	0	8	-86	2184	-1	2184	-7068

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	5	0	5	16	-2053	1	2053	825
37.50	5	60	60	16	-1927	1	1927	826
35.00	5	116	116	16	-1802	1	1802	826
33.00	5	158	158	16	-1702	0	1702	826
33.00	5	158	158	5	-1002	0	1002	828
30.00	5	191	191	5	-852	0	852	829
27.50	5	215	215	5	-726	0	726	829
25.00	5	235	235	5	-601	0	601	829
22.50	5	251	251	5	-475	0	475	830
20.00	5	263	263	5	-350	0	350	830
20.00	5	263	263	-5	350	0	350	830
17.50	5	251	251	-5	475	0	475	830
15.00	5	235	235	-5	601	0	601	829
12.50	5	215	215	-5	726	0	726	829
10.00	5	191	191	-5	852	0	852	829
7.00	5	158	158	-5	1002	-1	1002	828
7.00	5	158	158	-16	1702	-1	1702	826
5.00	5	116	116	-16	1802	-1	1802	826
2.50	5	60	60	-16	1927	-1	1927	826
0.00	5	0	5	-16	2053	-1	2053	825

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	0.5	1.4	0.0	0.00	0.09	0.00	0.08	0.17	65.00	99.90
60.00	1.2	0.4	1.2	0.0	0.42	0.11	0.00	0.08	0.53	65.00	99.90
55.00	1.0	0.3	1.1	0.0	0.76	0.12	0.00	0.08	0.88	65.00	73.91
50.00	0.9	0.3	0.9	0.0	1.04	0.13	0.00	0.07	1.16	65.00	55.85
48.00	0.8	0.3	0.9	0.0	1.13	0.13	0.00	0.07	1.26	65.00	51.50
48.00	0.8	0.3	0.9	0.0	0.76	0.09	0.00	0.05	0.85	65.00	76.21
45.00	0.7	0.2	0.8	0.0	0.85	0.10	0.00	0.05	0.95	65.00	68.71
45.00	0.7	0.2	0.8	0.0	2.62	0.34	0.12	0.30	2.99	65.00	21.72
40.00	0.6	0.2	0.6	0.0	1.75	0.35	0.11	0.28	2.12	65.00	30.62
35.00	0.5	0.2	0.5	0.0	1.08	0.35	0.10	0.27	1.49	65.00	43.56
32.00	0.4	0.1	0.4	0.0	0.85	0.35	0.09	0.26	1.28	65.00	50.83
32.00	0.4	0.1	0.4	0.0	0.61	0.41	0.08	0.32	1.03	65.00	63.27
30.00	0.4	0.1	0.4	0.0	0.92	0.41	0.07	0.32	1.34	65.00	48.65
30.00	0.4	0.1	0.4	0.0	0.92	0.42	0.07	0.32	1.34	65.00	48.45
25.00	0.3	0.1	0.3	0.0	1.73	0.42	0.07	0.30	2.15	65.00	30.18
21.25	0.2	0.1	0.2	0.0	2.27	0.42	0.06	0.29	2.69	65.00	24.15
21.25	0.2	0.1	0.2	0.0	2.26	0.47	0.06	0.24	2.73	65.00	23.80
20.00	0.2	0.1	0.2	0.0	2.39	0.47	0.06	0.24	2.86	65.00	22.74
15.00	0.1	0.0	0.1	0.0	2.85	0.47	0.05	0.23	3.32	65.00	19.60
10.00	0.0	0.0	0.0	0.0	3.24	0.47	0.05	0.22	3.71	65.00	17.54
5.00	0.0	0.0	0.0	0.0	3.57	0.47	0.05	0.21	4.04	65.00	16.10
0.00	0.0	0.0	0.0	0.0	3.84	0.47	0.04	0.20	4.32	65.00	15.06

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	0.5	1.2	0.0	0.00	0.09	0.00	0.08	0.17	65.00	99.90
60.00	1.0	0.4	1.1	0.0	0.42	0.11	0.00	0.08	0.53	65.00	99.90
55.00	0.9	0.3	1.0	0.0	0.76	0.12	0.00	0.08	0.88	65.00	74.06
50.00	0.8	0.3	0.9	0.0	1.03	0.13	0.00	0.07	1.16	65.00	55.97
48.00	0.8	0.3	0.8	0.0	1.13	0.13	0.00	0.07	1.26	65.00	51.62
48.00	0.8	0.3	0.8	0.0	0.76	0.09	0.00	0.05	0.85	65.00	76.39
45.00	0.7	0.2	0.8	0.0	0.85	0.10	0.00	0.05	0.94	65.00	68.88
45.00	0.7	0.2	0.8	0.0	4.93	0.45	0.12	0.71	5.41	65.00	12.01
40.00	0.6	0.2	0.6	0.0	2.18	0.45	0.11	0.67	2.68	65.00	24.22
35.00	0.5	0.2	0.5	0.0	0.72	0.45	0.10	0.64	1.57	65.00	41.45
32.00	0.4	0.1	0.4	0.0	1.73	0.45	0.09	0.62	2.23	65.00	29.12
32.00	0.4	0.1	0.4	0.0	1.64	0.51	0.08	0.22	2.15	65.00	30.19
30.00	0.4	0.1	0.4	0.0	1.81	0.51	0.07	0.21	2.32	65.00	28.05
30.00	0.4	0.1	0.4	0.0	1.81	0.51	0.07	0.21	2.32	65.00	27.98
25.00	0.3	0.1	0.3	0.0	2.18	0.51	0.07	0.20	2.68	65.00	24.21
21.25	0.2	0.1	0.2	0.0	2.41	0.51	0.07	0.19	2.92	65.00	22.28
21.25	0.2	0.1	0.2	0.0	2.40	0.56	0.06	0.23	2.96	65.00	21.99
20.00	0.2	0.1	0.2	0.0	2.51	0.56	0.06	0.22	3.06	65.00	21.21
15.00	0.1	0.0	0.1	0.0	2.90	0.55	0.05	0.21	3.46	65.00	18.80
10.00	0.0	0.0	0.0	0.0	3.24	0.55	0.05	0.20	3.79	65.00	17.16
5.00	0.0	0.0	0.0	0.0	3.52	0.55	0.05	0.19	4.07	65.00	15.98
0.00	0.0	0.0	0.0	0.0	3.75	0.55	0.04	0.19	4.30	65.00	15.11

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	0.2	0.8	0.0	5.89	0.24	0.00	1.11	6.15	65.00	10.56
37.50	0.7	0.2	0.8	0.1	2.26	0.24	0.00	1.10	2.56	65.00	25.37
35.00	0.7	0.3	0.8	0.2	1.36	0.24	0.00	1.08	1.98	65.00	32.78
33.00	0.7	0.3	0.8	0.2	4.13	0.24	0.00	1.07	4.40	65.00	14.78
33.00	0.7	0.3	0.8	0.2	4.13	0.35	0.00	0.26	4.48	65.00	14.49
30.00	0.7	0.3	0.8	0.3	5.11	0.35	0.00	0.24	5.47	65.00	11.89
27.50	0.7	0.3	0.8	0.4	5.87	0.35	0.00	0.22	6.22	65.00	10.44
25.00	0.7	0.3	0.8	0.4	6.57	0.35	0.00	0.20	6.93	65.00	9.39
22.50	0.7	0.3	0.8	0.4	7.21	0.35	0.00	0.18	7.57	65.00	8.59
20.00	0.7	0.3	0.8	0.4	7.80	0.35	0.00	0.17	8.16	65.00	7.97
20.00	0.7	0.3	0.8	0.4	7.80	0.47	0.00	0.65	8.28	65.00	7.85
17.50	0.7	0.3	0.8	0.4	5.68	0.47	0.00	0.67	6.16	65.00	10.55
15.00	0.7	0.3	0.8	0.3	3.50	0.47	0.00	0.68	3.99	65.00	16.29
12.50	0.7	0.3	0.8	0.2	1.27	0.47	0.00	0.70	1.78	65.00	36.45
10.00	0.7	0.3	0.8	0.2	1.31	0.47	0.00	0.72	1.86	65.00	35.02
7.00	0.7	0.3	0.8	0.1	4.02	0.47	0.00	0.74	4.52	65.00	14.38
7.00	0.7	0.3	0.8	0.1	4.02	0.58	0.00	1.55	4.75	65.00	13.67
5.00	0.7	0.3	0.8	0.0	7.89	0.59	0.00	1.56	8.52	65.00	7.63
2.50	0.7	0.2	0.8	0.0	12.99	0.59	0.00	1.58	13.61	65.00	4.78
0.00	0.7	0.2	0.8	0.0	18.14	0.59	0.00	1.60	18.75	65.00	3.47

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
Design Id: Item_35
Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	0.1	0.4	0.0	0.12	0.48	0.66	0.97	1.71	65.00	37.95
37.50	0.4	0.1	0.4	0.1	0.99	0.48	0.66	0.95	1.91	65.00	34.02
35.00	0.4	0.1	0.4	0.1	1.87	0.48	0.66	0.93	2.61	65.00	24.93
33.00	0.4	0.1	0.4	0.2	2.53	0.48	0.66	0.92	3.19	65.00	20.35
33.00	0.4	0.1	0.4	0.2	2.53	0.48	0.22	0.37	3.03	65.00	21.48
30.00	0.4	0.1	0.4	0.3	3.04	0.48	0.22	0.34	3.53	65.00	18.39
27.50	0.4	0.1	0.4	0.3	3.41	0.48	0.22	0.33	3.90	65.00	16.67
25.00	0.4	0.1	0.4	0.3	3.72	0.48	0.22	0.31	4.21	65.00	15.44
22.50	0.4	0.1	0.4	0.4	3.97	0.48	0.22	0.29	4.47	65.00	14.55
20.00	0.4	0.1	0.4	0.4	4.18	0.48	0.22	0.28	4.67	65.00	13.92
17.50	0.4	0.1	0.4	0.4	3.97	0.48	0.22	0.29	4.47	65.00	14.55
15.00	0.4	0.1	0.4	0.3	3.72	0.48	0.22	0.31	4.21	65.00	15.44
12.50	0.4	0.1	0.4	0.3	3.41	0.48	0.22	0.33	3.90	65.00	16.67
10.00	0.4	0.1	0.4	0.3	3.04	0.48	0.22	0.34	3.53	65.00	18.39
7.00	0.4	0.1	0.4	0.2	2.53	0.48	0.22	0.37	3.03	65.00	21.48
7.00	0.4	0.1	0.4	0.2	2.53	0.48	0.66	0.92	3.20	65.00	20.34
5.00	0.4	0.1	0.4	0.2	1.87	0.48	0.66	0.93	2.61	65.00	24.92
2.50	0.4	0.1	0.4	0.1	0.99	0.48	0.66	0.95	1.91	65.00	34.00
0.00	0.4	0.1	0.4	0.0	0.12	0.48	0.66	0.97	1.71	65.00	37.93

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.1	0.2	0.0	0.07	0.06	0.12	0.41	0.72	65.00	89.89
37.50	0.2	0.1	0.2	0.1	0.91	0.06	0.12	0.39	1.04	65.00	62.55
35.00	0.2	0.1	0.2	0.1	1.73	0.06	0.12	0.38	1.82	65.00	35.62
33.00	0.2	0.1	0.2	0.2	2.35	0.06	0.12	0.36	2.43	65.00	26.73
33.00	0.2	0.1	0.2	0.2	2.35	0.06	0.04	0.18	2.41	65.00	26.99
30.00	0.2	0.1	0.2	0.3	2.84	0.06	0.04	0.16	2.90	65.00	22.43
27.50	0.2	0.1	0.2	0.3	3.18	0.06	0.04	0.14	3.24	65.00	20.04
25.00	0.2	0.1	0.2	0.3	3.48	0.06	0.04	0.13	3.54	65.00	18.38
22.50	0.2	0.1	0.2	0.3	3.71	0.06	0.04	0.11	3.77	65.00	17.23
20.00	0.2	0.1	0.2	0.3	3.90	0.06	0.04	0.09	3.95	65.00	16.44
17.50	0.2	0.1	0.2	0.3	3.71	0.06	0.04	0.11	3.77	65.00	17.23
15.00	0.2	0.1	0.2	0.3	3.48	0.06	0.04	0.13	3.54	65.00	18.38
12.50	0.2	0.1	0.2	0.3	3.18	0.06	0.04	0.14	3.24	65.00	20.04
10.00	0.2	0.1	0.2	0.3	2.84	0.06	0.04	0.16	2.90	65.00	22.44
7.00	0.2	0.1	0.2	0.2	2.35	0.06	0.04	0.18	2.41	65.00	26.99
7.00	0.2	0.1	0.2	0.2	2.35	0.06	0.12	0.36	2.43	65.00	26.74
5.00	0.2	0.1	0.2	0.1	1.73	0.06	0.12	0.38	1.82	65.00	35.63
2.50	0.2	0.1	0.2	0.1	0.91	0.06	0.12	0.39	1.04	65.00	62.57
0.00	0.2	0.1	0.2	0.0	0.07	0.06	0.12	0.41	0.72	65.00	89.88

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	201	600	633	133
60.00	36	-12	38	0	201	602	635	439
55.00	72	-24	76	0	201	604	636	762
50.00	109	-36	114	0	202	605	638	1102
48.00	123	-41	130	0	202	606	638	1242
48.00	123	-41	130	0	202	606	638	1242
45.00	145	-48	153	0	202	607	640	1564
45.00	145	91	171	293	1150	5107	5235	1161
40.00	451	22	452	293	1150	5110	5238	1718
35.00	758	-47	760	293	1149	5112	5239	2304
32.00	942	-89	946	293	1149	5113	5241	2665
32.00	856	-89	860	244	1269	5120	5275	4867
30.00	979	-119	986	244	1269	5121	5276	5113
30.00	979	-119	986	244	1268	5120	5275	5315
25.00	1286	-195	1301	244	1268	5120	5275	5951
21.25	1517	-252	1537	244	1268	5122	5276	6442
21.25	1500	-252	1521	217	1277	5125	5282	8494
20.00	1577	-271	1600	217	1277	5122	5279	8663
15.00	1885	-348	1916	217	1275	5118	5275	9350
10.00	2192	-424	2232	217	1274	5113	5269	10063
5.00	2499	-501	2548	217	1272	5106	5262	10800
0.00	2805	-577	2864	217	1272	5106	5262	11560

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	199	601	633	133
60.00	36	-12	38	0	200	602	635	439
55.00	72	-24	76	0	200	604	636	762
50.00	109	-36	114	0	200	606	638	1102
48.00	123	-41	130	0	200	606	638	1242
48.00	123	-41	130	0	200	606	638	1242
45.00	145	-48	153	0	200	608	640	1564
45.00	145	117	186	-294	1353	5110	5286	2426
40.00	452	35	453	-294	1354	5111	5288	2984
35.00	758	-46	760	-294	1356	5113	5289	3568
32.00	942	-95	947	-294	1356	5114	5291	3930
32.00	856	-95	861	-245	1239	5122	5270	6132
30.00	979	-124	987	-245	1239	5123	5271	6378
30.00	979	-124	987	-245	1239	5121	5269	6580
25.00	1286	-199	1302	-245	1240	5120	5268	7216
21.25	1517	-255	1538	-245	1240	5122	5270	7707
21.25	1501	-255	1522	-218	1232	5125	5271	9759
20.00	1578	-273	1601	-218	1232	5122	5268	9928
15.00	1885	-347	1917	-218	1232	5116	5262	10615
10.00	2192	-421	2232	-218	1231	5110	5256	11327
5.00	2498	-495	2547	-218	1230	5102	5248	12065
0.00	2805	-569	2862	-218	1230	5102	5248	12824

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-293	139	325	0	404	4500	4518	-949
37.50	-158	125	202	0	529	4499	4530	-951
35.00	-24	107	110	0	654	4498	4545	-951
33.00	84	90	124	0	754	4498	4560	-951
33.00	84	90	124	0	239	1501	1520	-246
30.00	138	79	159	0	389	1501	1550	-246
27.50	183	66	195	0	514	1500	1586	-245
25.00	228	48	234	0	639	1500	1630	-245
22.50	273	27	275	0	764	1499	1683	-244
20.00	318	2	318	0	890	1499	1743	-244
20.00	318	2	318	0	375	-1499	1545	456
17.50	273	-11	274	0	501	-1500	1581	456
15.00	228	-28	230	0	626	-1500	1626	456
12.50	183	-48	190	0	751	-1501	1678	455
10.00	138	-73	156	0	876	-1502	1739	455
7.00	84	-107	136	0	1026	-1503	1819	454
7.00	84	-107	136	0	511	-4502	4531	1149
5.00	-24	-120	123	0	611	-4502	4543	1149
2.50	-159	-141	212	0	736	-4502	4562	1151
0.00	-294	-165	337	0	861	-4503	4584	1151

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 2 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	49	0	49	86	-2200	8	2200	-124
37.50	49	64	81	86	-2075	7	2075	-124
35.00	50	125	134	86	-1950	6	1950	-123
33.00	50	170	177	86	-1850	6	1850	-123
33.00	50	170	177	29	-1050	3	1050	-121
30.00	50	205	211	29	-900	2	900	-120
27.50	50	230	236	29	-775	2	775	-120
25.00	50	252	257	29	-650	2	650	-120
22.50	50	269	274	29	-525	1	525	-119
20.00	50	283	288	29	-400	1	400	-119
20.00	50	283	288	-29	400	-2	400	-119
17.50	50	269	274	-29	525	-2	525	-119
15.00	50	252	257	-29	650	-3	650	-120
12.50	50	230	236	-29	775	-3	775	-120
10.00	50	205	211	-29	900	-3	900	-120
7.00	50	170	177	-29	1050	-4	1050	-121
7.00	50	170	177	-86	1850	-7	1850	-123
5.00	49	125	134	-86	1950	-7	1950	-123
2.50	49	64	81	-86	2075	-8	2075	-124
0.00	49	0	49	-86	2200	-9	2200	-124

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	27	0	27	16	-2051	6	2051	-14
37.50	27	60	66	16	-1926	5	1926	-13
35.00	27	116	119	16	-1801	5	1801	-12
33.00	28	158	160	16	-1700	4	1700	-12
33.00	28	158	160	5	-1000	2	1000	-11
30.00	28	191	193	5	-850	2	850	-10
27.50	28	214	216	5	-725	2	725	-10
25.00	28	234	236	5	-600	1	600	-9
22.50	28	251	252	5	-475	1	475	-9
20.00	28	263	264	5	-350	1	350	-9
20.00	28	263	264	-5	350	-1	350	-9
17.50	28	251	252	-5	475	-1	475	-9
15.00	28	234	236	-5	600	-2	600	-9
12.50	28	214	216	-5	725	-2	725	-10
10.00	28	191	193	-5	850	-3	850	-10
7.00	28	158	160	-5	1000	-3	1000	-11
7.00	28	158	160	-16	1700	-5	1700	-12
5.00	27	116	119	-16	1801	-5	1801	-12
2.50	27	60	66	-16	1926	-6	1926	-13
0.00	27	0	27	-16	2051	-6	2051	-13

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.4	2.7	2.7	0.0	0.00	0.01	0.00	0.07	0.13	65.00	99.90
60.00	0.4	2.4	2.4	0.0	0.37	0.02	0.00	0.07	0.39	65.00	99.90
55.00	0.4	2.1	2.1	0.0	0.66	0.04	0.00	0.07	0.70	65.00	93.07
50.00	0.3	1.8	1.8	0.0	0.90	0.05	0.00	0.06	0.95	65.00	68.42
48.00	0.3	1.7	1.7	0.0	0.98	0.06	0.00	0.06	1.04	65.00	62.66
48.00	0.3	1.7	1.7	0.0	0.66	0.04	0.00	0.04	0.70	65.00	92.69
45.00	0.3	1.5	1.5	0.0	0.74	0.05	0.00	0.04	0.78	65.00	82.85
45.00	0.3	1.5	1.5	0.0	0.80	0.04	0.69	1.02	1.87	65.00	34.82
40.00	0.2	1.2	1.2	0.0	1.95	0.05	0.63	0.95	2.32	65.00	27.96
35.00	0.2	1.0	1.0	0.0	3.01	0.07	0.58	0.88	3.24	65.00	20.08
32.00	0.2	0.8	0.8	0.0	3.58	0.07	0.55	0.85	3.78	65.00	17.19
32.00	0.2	0.8	0.8	0.0	3.26	0.14	0.46	0.75	3.49	65.00	18.63
30.00	0.1	0.7	0.7	0.0	3.62	0.14	0.44	0.74	3.84	65.00	16.91
30.00	0.1	0.7	0.7	0.0	3.62	0.15	0.44	0.74	3.85	65.00	16.88
25.00	0.1	0.5	0.5	0.0	4.43	0.16	0.41	0.69	4.64	65.00	14.00
21.25	0.1	0.4	0.4	0.0	4.95	0.16	0.39	0.66	5.16	65.00	12.61
21.25	0.1	0.4	0.4	0.0	4.90	0.22	0.34	0.62	5.15	65.00	12.62
20.00	0.1	0.3	0.3	0.0	5.06	0.22	0.34	0.61	5.31	65.00	12.25
15.00	0.0	0.2	0.2	0.0	5.63	0.23	0.31	0.57	5.88	65.00	11.05
10.00	0.0	0.1	0.1	0.0	6.10	0.24	0.29	0.54	6.36	65.00	10.22
5.00	0.0	0.0	0.0	0.0	6.51	0.25	0.27	0.51	6.77	65.00	9.60
0.00	0.0	0.0	0.0	0.0	6.84	0.25	0.25	0.49	7.11	65.00	9.14

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_35
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.4	2.7	2.7	0.0	0.00	0.01	0.00	0.07	0.13	65.00	99.90
60.00	0.4	2.4	2.4	0.0	0.37	0.02	0.00	0.07	0.39	65.00	99.90
55.00	0.4	2.1	2.1	0.0	0.66	0.04	0.00	0.07	0.70	65.00	93.06
50.00	0.3	1.8	1.8	0.0	0.90	0.05	0.00	0.06	0.95	65.00	68.41
48.00	0.3	1.7	1.7	0.0	0.98	0.06	0.00	0.06	1.04	65.00	62.65
48.00	0.3	1.7	1.7	0.0	0.66	0.04	0.00	0.04	0.70	65.00	92.68
45.00	0.3	1.5	1.5	0.0	0.74	0.05	0.00	0.04	0.78	65.00	82.84
45.00	0.3	1.5	1.5	0.0	0.89	0.08	0.69	1.03	1.97	65.00	33.06
40.00	0.2	1.2	1.2	0.0	1.96	0.09	0.63	0.95	2.47	65.00	26.36
35.00	0.2	1.0	1.0	0.0	3.00	0.10	0.58	0.88	3.27	65.00	19.90
32.00	0.2	0.8	0.8	0.0	3.59	0.11	0.55	0.85	3.82	65.00	17.02
32.00	0.2	0.8	0.8	0.0	3.27	0.17	0.46	0.76	3.53	65.00	18.43
30.00	0.1	0.7	0.7	0.0	3.63	0.17	0.44	0.74	3.88	65.00	16.75
30.00	0.1	0.7	0.7	0.0	3.63	0.18	0.44	0.74	3.89	65.00	16.73
25.00	0.1	0.5	0.5	0.0	4.43	0.19	0.41	0.69	4.68	65.00	13.90
21.25	0.1	0.4	0.4	0.0	4.95	0.20	0.39	0.66	5.19	65.00	12.53
21.25	0.1	0.4	0.4	0.0	4.90	0.25	0.34	0.62	5.18	65.00	12.54
20.00	0.1	0.3	0.3	0.0	5.06	0.25	0.34	0.61	5.34	65.00	12.17
15.00	0.0	0.2	0.2	0.0	5.63	0.26	0.31	0.57	5.91	65.00	11.00
10.00	0.0	0.1	0.1	0.0	6.10	0.27	0.29	0.54	6.39	65.00	10.17
5.00	0.0	0.0	0.0	0.0	6.50	0.27	0.27	0.51	6.79	65.00	9.57
0.00	0.0	0.0	0.0	0.0	6.83	0.28	0.25	0.49	7.13	65.00	9.12

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.5	1.5	0.0	5.16	0.06	0.00	0.63	5.23	65.00	12.42
37.50	0.3	1.6	1.6	0.0	3.09	0.06	0.00	0.63	3.17	65.00	20.51
35.00	0.3	1.6	1.6	0.0	1.72	0.06	0.00	0.63	2.02	65.00	32.21
33.00	0.3	1.6	1.7	0.0	1.84	0.06	0.00	0.64	2.19	65.00	29.71
33.00	0.3	1.6	1.7	0.0	1.84	0.02	0.00	0.21	1.89	65.00	34.33
30.00	0.3	1.7	1.7	0.0	2.52	0.02	0.00	0.22	2.54	65.00	25.55
27.50	0.3	1.7	1.8	0.0	3.10	0.02	0.00	0.22	3.12	65.00	20.81
25.00	0.3	1.8	1.8	0.0	3.65	0.02	0.00	0.23	3.68	65.00	17.66
22.50	0.3	1.8	1.8	0.0	4.19	0.02	0.00	0.23	4.21	65.00	15.43
20.00	0.3	1.8	1.8	0.0	4.70	0.02	0.00	0.24	4.72	65.00	13.76
20.00	0.3	1.8	1.8	0.0	4.70	0.03	0.00	0.22	4.73	65.00	13.75
17.50	0.3	1.8	1.8	0.0	4.09	0.03	0.00	0.22	4.12	65.00	15.76
15.00	0.3	1.8	1.8	0.0	3.53	0.03	0.00	0.23	3.57	65.00	18.21
12.50	0.3	1.8	1.8	0.0	2.99	0.03	0.00	0.23	3.04	65.00	21.40
10.00	0.3	1.7	1.7	0.0	2.48	0.03	0.00	0.24	2.53	65.00	25.69
7.00	0.3	1.6	1.7	0.0	2.08	0.03	0.00	0.25	2.16	65.00	30.10
7.00	0.3	1.6	1.7	0.0	2.08	0.08	0.00	0.63	2.41	65.00	27.03
5.00	0.3	1.6	1.6	0.0	1.91	0.08	0.00	0.63	2.21	65.00	29.46
2.50	0.3	1.6	1.6	0.0	3.19	0.08	0.00	0.64	3.28	65.00	19.83
0.00	0.3	1.5	1.5	0.0	5.32	0.08	0.00	0.64	5.40	65.00	12.03

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 2 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.8	0.8	0.0	0.72	0.01	0.66	0.97	1.82	65.00	35.62
37.50	0.2	0.8	0.8	0.1	1.24	0.01	0.66	0.95	1.95	65.00	33.28
35.00	0.2	0.8	0.9	0.1	2.13	0.01	0.66	0.93	2.50	65.00	25.96
33.00	0.2	0.9	0.9	0.2	2.80	0.01	0.66	0.92	3.09	65.00	21.04
33.00	0.2	0.9	0.9	0.2	2.80	0.01	0.22	0.37	2.84	65.00	22.91
30.00	0.2	0.9	0.9	0.3	3.32	0.01	0.22	0.35	3.35	65.00	19.43
27.50	0.2	0.9	0.9	0.3	3.69	0.01	0.22	0.33	3.71	65.00	17.51
25.00	0.2	0.9	0.9	0.3	4.01	0.01	0.22	0.31	4.03	65.00	16.14
22.50	0.2	0.9	0.9	0.4	4.26	0.01	0.22	0.29	4.29	65.00	15.17
20.00	0.2	0.9	0.9	0.4	4.47	0.01	0.22	0.28	4.49	65.00	14.48
17.50	0.2	0.9	0.9	0.4	4.26	0.01	0.22	0.29	4.29	65.00	15.17
15.00	0.2	0.9	0.9	0.3	4.00	0.01	0.22	0.31	4.03	65.00	16.14
12.50	0.2	0.9	0.9	0.3	3.69	0.01	0.22	0.33	3.71	65.00	17.51
10.00	0.2	0.9	0.9	0.3	3.32	0.01	0.22	0.35	3.34	65.00	19.44
7.00	0.2	0.9	0.9	0.2	2.80	0.01	0.22	0.37	2.84	65.00	22.92
7.00	0.2	0.9	0.9	0.2	2.80	0.01	0.66	0.92	3.09	65.00	21.04
5.00	0.2	0.8	0.9	0.1	2.13	0.01	0.66	0.93	2.50	65.00	25.97
2.50	0.2	0.8	0.8	0.1	1.24	0.01	0.66	0.95	1.95	65.00	33.30
0.00	0.2	0.8	0.8	0.0	0.72	0.01	0.66	0.97	1.82	65.00	35.64

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459
 Design Id: Item_35
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.4	0.4	0.0	0.40	0.00	0.12	0.41	0.82	65.00	79.67
37.50	0.1	0.4	0.4	0.1	1.04	0.00	0.12	0.39	1.11	65.00	58.36
35.00	0.1	0.4	0.4	0.1	1.87	0.00	0.12	0.38	1.90	65.00	34.15
33.00	0.1	0.4	0.4	0.2	2.48	0.00	0.12	0.36	2.51	65.00	25.89
33.00	0.1	0.4	0.4	0.2	2.48	0.00	0.04	0.18	2.49	65.00	26.12
30.00	0.1	0.4	0.4	0.2	2.97	0.00	0.04	0.16	2.98	65.00	21.83
27.50	0.1	0.4	0.4	0.3	3.32	0.00	0.04	0.14	3.32	65.00	19.55
25.00	0.1	0.4	0.4	0.3	3.61	0.00	0.04	0.13	3.62	65.00	17.98
22.50	0.1	0.4	0.4	0.3	3.85	0.00	0.04	0.11	3.85	65.00	16.87
20.00	0.1	0.4	0.4	0.3	4.03	0.00	0.04	0.09	4.03	65.00	16.11
17.50	0.1	0.4	0.4	0.3	3.85	0.00	0.04	0.11	3.85	65.00	16.87
15.00	0.1	0.4	0.4	0.3	3.61	0.00	0.04	0.13	3.62	65.00	17.98
12.50	0.1	0.4	0.4	0.3	3.32	0.00	0.04	0.14	3.32	65.00	19.56
10.00	0.1	0.4	0.4	0.2	2.97	0.00	0.04	0.16	2.98	65.00	21.83
7.00	0.1	0.4	0.4	0.2	2.48	0.00	0.04	0.18	2.49	65.00	26.12
7.00	0.1	0.4	0.4	0.2	2.48	0.00	0.12	0.36	2.51	65.00	25.89
5.00	0.1	0.4	0.4	0.1	1.87	0.00	0.12	0.38	1.90	65.00	34.16
2.50	0.1	0.4	0.4	0.1	1.04	0.00	0.12	0.39	1.11	65.00	58.39
0.00	0.1	0.4	0.4	0.0	0.40	0.00	0.12	0.41	0.82	65.00	79.72

MINIMUM DEFLECTION RATIO // DEFLECTION LIMIT / DEFLECTION // IS

BY VALMONT INDUSTRIES
Design Id: Item_35

FOR: GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

FLANGE ANALYSIS

FLANGE FOR THE A - B JOINT : CONTROLLING LOAD CASE BASED ON 50% OF POLE CAPACITY - Left and Center Poles

Input Data

Results

Applied Reactions

Resultant Moment = 4,455 in-kips
Torsion = 0 in-kips
Resultant Shear = 0 lbs
Axial = 0 lbs

Bolts

Number of Bolts = 12
Bolt Diameter = 1.00 in
Bolt Material = A325
Bolt Circle = 31.00 in

Flange

Outside Diameter = 33.50 in
Thickness = 1.500 in
Yield Strength = 50 ksi
Tensile Strength = 65 ksi
Valmont Material Spec. = S-56

Tube

No. of sides = 12
Design Diameter = 26.185 in
Detailed "A" Sect. Dia = 26.221 in
Detailed "B" Sect. Dia = 26.149 in
Thickness = 0.3750 in
Thickness for M. Cap. = 0.2500 in
Yield = 65 ksi

Bolts

Maximum Bolt Axial Force = 47,908 lbs
Maximum Bolt Shear = 260 lbs
Allowable Axial Stress = 85.00 ksi
Allowable Axial w/ Shear = 85.00 ksi
Allowable Shear Stress = 54.00 ksi
Minimum Safety Factor = 1.08
Shear Safety Factor = 99.00
Tension Safety Factor = 1.08
Combined Safety Factor = 1.08

Flange

Weight = 248 lbs
Controlling Stress = Shear
Minimum Safety Factor = 1.78
Bending Safety Factor = 2.25
Shear Safety Factor = 1.78
Bearing Safety Factor = 432.44

*** BOLT COORDINATES ***

BOLT NO.	X-COORD	Y-COORD		BOLT NO.	X-COORD	Y-COORD
1	15.50	0.00	*	2	13.42	7.75
3	7.75	13.42	*	4	0.00	15.50

BY VALMONT INDUSTRIES FOR:
Design Id: Item_35

GRAND RIVER DAM AUTHORITY, 161KV H-FR (ITEM 35), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

*** ANCHOR BOLT AND BASEPLATE DESIGN FOR Left and Center Poles ***

ANCHOR BOLTS GEOMETRY AND MATERIAL

Number of bolts	12
Diameter	2.25 in
Length	84 in
Anchor bolt to baseplate nuts pattern	Two nuts
Anchor bolts include washers	Yes
Steel Spec.	S23

Tensile Stress	100000 psi
Allowable Axial Stress	75000 psi
Allowable Bending Stress	75000 psi
Allowable Shear Stress	35000 psi
Gross Area	3.98 in ²
Stress Area	3.25 in ²

CAGE ASSEMBLY / BOLT PATTERN

Cage Weight	1580 lb
Shipped As	Assembled Welded
Projection Length	10.50 in
Bolt Pattern	Custom
Max Bolt Circle	46.00 in

Template Diameter	52.00 in
Bolt-bolt spacing - Actual	11.90 in
Bolt-bolt spacing - Min.	6.00 in
Bolt to shaft face spacing - Actual	4.00 in
Bolt to shaft face spacing - Min.	3.25 in
Edge distance - Actual	3.00 in
Edge distance - Min.	3.00 in

Design Code Concrete	ASCE SEI 48-11
Concrete f'c	4000 psi
Maximum bolt tension	101901 lb
Actual Bond Stress	199 psi
Allowable bond stress	333 psi
Required embedment depth	43.302 in
Max. allowable leveling	2.500 in

ANALYSIS RESULTS

Design Code	ASCE/NESC
Governing Load Case	2-2
Safety Factor	1.47
Max. Axial Stress	32530 psi

POLE SHAFT

Pole Shape	Twelve
Diameter	38.00 in
Wall Thickness	0.37500 in
Pole Material	S22
Pole Yield	65000 psi

BASE PLATE

Governing Load Case	M501
Base Plate Shape	Match pole
Drawing Number	POL6-106
Overall Length	52.00 in
Overall Width	52.00 in
Side Width	13.93 in
Top Width	13.93 in

Thickness	2.50000 in
Valmont Spec	S56
Other Spec	A572
Actual Weight	1110 lb

Critical Failure Mode	2
Total length of Fail Line	68.65 in
Effective Length	61.38 in
Total moment along fail line	1537755 in-lb
Bending Stress	24052 psi
Allowable Stress	50000 psi

Controlling Loads

Load Case	Axial force (lb)	Shear Force (lb)	Moment X (in-kip)	Moment Y (in-kip)	Moment Z (in-kip)	Component
2-2 M501	31728 0	26613 0	14223 9038	-1960 10771	-1083 0	Bolts Plate

Bolt Coordinates and Forces for Controlling Load Case

Bolt Number	X-Coord (in)	Y-Coord (in)	Axial force (lb)	Shear Force (lb)	Axial Stress (ksi)	Shear Stress (ksi)	Bending Stress (ksi)	Safety Factor	Loadcase Number
1	22.998	0.000	101901	0	31.35	0.00	0.00	2.392	M901
2	19.917	11.499	-66421	5774	-20.44	1.45	22.37	1.751	2-1
3	11.499	19.917	-98847	5105	-30.41	1.28	19.77	1.493	2-1
4	0.000	22.998	-105722	4801	-32.53	1.21	18.60	1.466	2-2
5	-11.499	19.917	-84810	5592	-26.10	1.41	21.66	1.569	2-2
6	-19.917	11.499	-41882	6046	-12.89	1.52	23.42	2.064	2-2
7	-22.998	0.000	-101901	0	-31.35	0.00	0.00	2.392	M901
8	-19.917	-11.499	61196	5815	18.83	1.46	22.52	1.812	2-2
9	-11.499	-19.917	93726	5149	28.84	1.30	19.94	1.536	2-2
10	0.000	-22.998	100839	4780	31.03	1.20	18.51	1.513	2-1
11	11.499	-19.917	79760	5567	24.54	1.40	21.56	1.625	2-1
12	19.917	-11.499	36698	6016	11.29	1.51	23.30	2.166	2-1

Note: positive axial force indicates tension, negative axial force indicates compression.

----- Multi Pole Leg Configuration -----

Pole Design	Pole Instance	Above Ground Height (ft)	X (ft)	Ground Line Y (ft)	Z (ft)
Item_36	Left	65.00	-40.00	0.00	0.00
Item_36	Center	65.00	0.00	0.00	0.00
Item_36	Right	65.00	40.00	0.00	0.00

----- Multi Pole Arm Instance Configuration -----

Arm Number	Arm Label	Base End Mounted to	Base End Connection	Tip End Mounted to	Tip End Connection	Mounting Elevation (ft)	Orientation (Degrees)	Horizontal Length (ft)	Rise (in)
1	Cond BM	Right	Fixed	Center	Fixed	45.00	180.00	40.00	0.00
2	Cond BM	Center	Fixed	Left	Fixed	45.00	180.00	40.00	0.00
3	Equip BM	Right	Fixed	Center	Fixed	32.00	180.00	40.00	0.00
4	Equip BM	Center	Fixed	Left	Fixed	32.00	180.00	40.00	0.00
5	Equip BM	Right	Fixed	Center	Fixed	21.25	180.00	40.00	0.00
6	Equip BM	Center	Fixed	Left	Fixed	21.25	180.00	40.00	0.00

----- Multi Pole Arm Results -----

Arm Label	Arm Num	Arm Sec	Length (ft)	Tip Diam. (in)	Base Diam. (in)	Thick. (in)	Shaft Shape	Joint Type	Weight (lbs)	Controlling Load Case	Combined Stress (ksi)	Allowable Stress (ksi)	Safety Factor
Cond BM	1	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1LC1 NESC H	34.20	65.00	1.90
Cond BM	2	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1LC1 NESC H	28.77	65.00	2.26
Equip BM	3	1	40.00	18.00	18.00	0.25000	8 Sides		2001	2TC1 Extrem	12.33	65.00	5.27
Equip BM	4	1	40.00	18.00	18.00	0.25000	8 Sides		2001	1TC1 NESC H	15.00	65.00	4.33
Equip BM	5	1	40.00	18.00	18.00	0.25000	8 Sides		2001	2TC1 Extrem	11.09	65.00	5.86
Equip BM	6	1	40.00	18.00	18.00	0.25000	8 Sides		2001	2TC1 Extrem	11.34	65.00	5.73

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** SUMMARY ***

----- Left DESIGN SUMMARY -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Section Characteristics	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
Weight (lbs)	6247	1109			

----- Left ANALYSIS SUMMARY -----

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Pole Top
Governing Load Case	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He
Height (ft)	0.00	0.00	48.00	65.00
Resultant Moment (in-kips)	16042	16042	601	2
Shear Force (lbs)	29088	29088	3130	2755
Axial Force (lbs)	24609	24609	2869	1203
Combined Stress (ksi)	38.65	38.65	4.68	0.56
Allowable Stress (ksi)	65.00	65.00	65.00	65.00
Allowable/Combined Stress	1.68	1.68	13.90	99.90
Total Deflection (in)	0.00	0.00	9.60	15.38

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** SUMMARY ***

----- Center DESIGN SUMMARY -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Section Characteristics	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
Weight (lbs)	6247	1109			

----- Center ANALYSIS SUMMARY -----

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Pole Top
Governing Load Case	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He
Height (ft)	0.00	0.00	48.00	65.00
Resultant Moment (in-kips)	22382	22382	604	2
Shear Force (lbs)	44007	44007	3153	2765
Axial Force (lbs)	46058	46058	2847	1181
Combined Stress (ksi)	53.69	53.69	4.70	0.56
Allowable Stress (ksi)	65.00	65.00	65.00	65.00
Allowable/Combined Stress	1.21	1.21	13.83	99.90
Total Deflection (in)	0.00	0.00	12.88	20.39

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** SUMMARY ***

----- Right DESIGN SUMMARY -----

Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Section Characteristics	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
Weight (lbs)	6247	1109			

----- Right ANALYSIS SUMMARY -----

	Pt. of Fixity	Governing Level Sec.1	Governing Level Sec.2	Pole Top
Governing Load Case	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He	1LC1 NESC He
Height (ft)	0.00	0.00	48.00	65.00
Resultant Moment (in-kips)	16032	16032	601	2
Shear Force (lbs)	29198	29198	3130	2755
Axial Force (lbs)	33391	33391	2870	1204
Combined Stress (ksi)	38.83	38.83	4.67	0.56
Allowable Stress (ksi)	65.00	65.00	65.00	65.00
Allowable/Combined Stress	1.67	1.67	13.91	99.90
Total Deflection (in)	0.00	0.00	9.59	15.35

Note: Diameters are outside, measured across the flats
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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----- Pole Left SUMMARY OF SECTION DIMENSIONS AS DETAILED -----					
Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Flange Thickness (in)	1.500				
Weld Root Gap (in)	0.250				
Theoretical Design Section Dimension	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
As Detailed Section Characteristic	/First/	/Second/			
Base Diameter (in)	37.995	26.149			
Top Diameter (in)	26.221	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	47.833	16.854			

BY VALMONT INDUSTRIES
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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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----- Pole Center SUMMARY OF SECTION DIMENSIONS AS DETAILED -----					
Height Above Base Plate (ft)	65.00	Ground Line Diameter (in)	38.000	Pole Shaft Weight (lbs)	7355
		Top Diameter (in)	22.000		
		Pole Taper (in/ft)	0.24615	Shape:	12 Sides
Connections Between Sections	/First/				
Height Above Ground (ft)	48.00				
Type	Flange Joint				
Flange Thickness (in)	1.500				
Weld Root Gap (in)	0.250				
Theoretical Design Section Dimension	/First/	/Second/			
Base Diameter (in)	38.000	26.185			
Top Diameter (in)	26.185	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	48.000	17.000			
As Detailed Section Characteristic	/First/	/Second/			
Base Diameter (in)	37.995	26.149			
Top Diameter (in)	26.221	22.000			
Thickness (in)	0.37500	0.25000			
Length (ft)	47.833	16.854			

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----- Pole Right SUMMARY OF SECTION DIMENSIONS AS DETAILED -----

Height Above Base Plate (ft) 65.00 Ground Line Diameter (in) 38.000 Pole Shaft Weight (lbs) 7355

Top Diameter (in) 22.000

Pole Taper (in/ft) 0.24615 Shape: 12 Sides

Connections Between Sections /First/

Height Above Ground (ft) 48.00
Type Flange Joint
Flange Thickness (in) 1.500
Weld Root Gap (in) 0.250

Theoretical Design Section Dimension /First/ /Second/

Base Diameter (in) 38.000 26.185
Top Diameter (in) 26.185 22.000
Thickness (in) 0.37500 0.25000
Length (ft) 48.000 17.000

As Detailed Section Characteristic /First/ /Second/

Base Diameter (in) 37.995 26.149
Top Diameter (in) 26.221 22.000
Thickness (in) 0.37500 0.25000
Length (ft) 47.833 16.854

Note: Diameter are outside, measured across the flats

BY VALMONT INDUSTRIES FOR:
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*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Reaction Instance	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)
1TC1 NESC	Left	14634	-2182	14796	1699	23716	6748	25277	26163
1TC1 NESC	Center	20655	-2336	20786	-8	46137	8379	38938	39829
1TC1 NESC	Right	14654	-2325	14838	-1708	34353	8352	25185	26533
1LC1 NESC	Left	15957	-1655	16042	1804	24668	4456	28695	29039
1LC1 NESC	Center	22310	-1791	22382	-10	46181	5938	43475	43879
1LC1 NESC	Right	15930	-1798	16032	-1815	33449	6106	28484	29131
1TC2 NESC	Left	7781	-1729	7971	806	14885	5281	13294	14305
1TC2 NESC	Center	10671	-1887	10837	-2	26559	6876	20174	21314
1TC2 NESC	Right	7815	-1912	8045	-807	23462	7123	13332	15115
1LC2 NESC	Left	9095	-1203	9174	909	15822	2999	16713	16980
1LC2 NESC	Center	12316	-1344	12389	-4	26582	4434	24716	25110
1LC2 NESC	Right	9084	-1386	9189	-913	22551	4867	16625	17323
2TC1 Extre	Left	8800	-3539	9485	1047	11771	13124	15234	20108
2TC1 Extre	Center	12564	-3709	13100	-1	29867	14863	23841	28095
2TC1 Extre	Right	8941	-3629	9649	-1045	26672	14084	15523	20960
2LC1 Extre	Left	14046	-1482	14124	1462	15461	4154	28887	29184
2LC1 Extre	Center	19148	-1586	19214	-7	29998	5290	41990	42322
2LC1 Extre	Right	14028	-1574	14116	-1470	23131	5255	28738	29214
2TC2 Extre	Left	4299	-2811	5137	480	7118	10780	7359	13053
2TC2 Extre	Center	6068	-2969	6755	5	17136	12387	11588	16962
2TC2 Extre	Right	4445	-2932	5325	-473	18545	12003	7752	14289
2LC2 Extre	Left	9522	-757	9552	891	10773	1843	21010	21091
2LC2 Extre	Center	12623	-849	12652	-2	17215	2811	29748	29880
2LC2 Extre	Right	9516	-879	9557	-894	14988	3145	20958	21193
3C1 Extrem	Left	12486	-1069	12532	1444	22337	2854	21632	21819
3C1 Extrem	Center	17595	-1168	17633	-5	40872	3886	33345	33571
3C1 Extrem	Right	12472	-1183	12528	-1450	28018	4060	21523	21903

Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES FOR:
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*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Reaction Instance	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)
3C2 Extrem Left		7035	-874	7089	715	12595	2109	12062	12245
3C2 Extrem Center		9593	-988	9644	-2	21117	3247	18229	18516
3C2 Extrem Right		7029	-1030	7104	-718	17615	3645	12010	12550
4TC1 Ice a Left		12870	-1752	12989	1471	18866	5358	22170	22808
4TC1 Ice a Center		18082	-1866	18178	-6	37849	6552	34037	34662
4TC1 Ice a Right		12881	-1847	13013	-1478	27604	6404	22093	23003
4LC1 Ice a Left		13656	-1433	13731	1533	19439	3976	24199	24523
4LC1 Ice a Center		19063	-1536	19125	-7	37871	5078	36726	37075
4LC1 Ice a Right		13636	-1528	13722	-1541	27055	5046	24042	24566
4TC2 Ice a Left		7339	-1360	7464	743	9529	4034	12482	13118
4TC2 Ice a Center		10002	-1482	10111	-2	17787	5263	18821	19543
4TC2 Ice a Right		7360	-1498	7511	-745	16502	5417	12496	13620
4LC2 Ice a Left		8119	-1041	8186	804	10095	2658	14512	14753
4LC2 Ice a Center		10976	-1153	11037	-3	17800	3788	21513	21844
4LC2 Ice a Right		8111	-1179	8196	-808	15950	4054	14443	15001
5TC1 Defle Left		3715	-1496	4005	470	14195	5830	6580	8791
5TC1 Defle Center		5419	-1591	5648	3	26590	6760	10602	12574
5TC1 Defle Right		3802	-1581	4117	-465	20110	6643	6818	9519
5LC1 Defle Left		6765	-300	6771	712	16320	633	14526	14540
5LC1 Defle Center		9249	-355	9256	-1	26626	1187	21168	21202
5LC1 Defle Right		6763	-385	6774	-712	18028	1480	14510	14586
5TC2 Defle Left		1842	-1422	2327	231	9670	5516	3298	6427
5TC2 Defle Center		2704	-1526	3105	4	17340	6546	5453	8520
5TC2 Defle Right		1927	-1530	2461	-225	15285	6571	3548	7468
5LC2 Defle Left		4882	-227	4887	471	11783	325	11245	11250
5LC2 Defle Center		6521	-291	6528	0	17363	972	16024	16053
5LC2 Defle Right		4881	-335	4892	-471	13199	1402	11236	11323

Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

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*** POLE SHAFT POINT OF FIXITY REACTIONS ***

Loading Case Identifier	Reaction Instance	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Shear Resultant (X & Y) (lbs)
6 Construc	Left	497	-1267	1361	54	19450	3684	990	3814
6 Construc	Center	703	-1346	1519	0	37136	4431	1625	4720
6 Construc	Right	497	-1327	1417	-55	26197	4185	985	4299
6 Construc	Left	3151	-445	3182	365	10759	984	5565	5651
6 Construc	Center	4452	-519	4482	-1	16424	1729	8682	8853
6 Construc	Right	3149	-556	3198	-365	13301	2087	5553	5932

Note: Positive vertical force is downward.
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES
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*** INPUT LOADS LOCATIONS ***

Load Number	Mounted To	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Measured From	Description	Notes
1	Left	65.00	65.00	0.00	0.00	Left	Spike	
2	Center	65.00	65.00	0.00	0.00	Center	Spike	
3	Right	65.00	65.00	0.00	0.00	Right	Spike	
4	Left	65.00	65.00	0.00	0.00	Left	OPGW	
5	Center	65.00	65.00	0.00	0.00	Center	OPGW	
6	Right	65.00	65.00	0.00	0.00	Right	OPGW	
7	Arm 1	45.00	45.00	7.00	180.00	Right	Conductor	
8	Arm 1	45.00	45.00	20.00	180.00	Right	Conductor	
9	Arm 1	45.00	45.00	33.00	180.00	Right	Conductor	
10	Arm 2	45.00	45.00	7.00	180.00	Center	Conductor	
11	Arm 2	45.00	45.00	20.00	180.00	Center	Conductor	
12	Arm 2	45.00	45.00	33.00	180.00	Center	Conductor	
13	Arm 1	45.00	45.00	7.00	180.00	Right	Surge Arrester	
14	Arm 1	45.00	45.00	20.00	180.00	Right	Surge Arrester	
15	Arm 1	45.00	45.00	33.00	180.00	Right	Surge Arrester	
16	Arm 2	45.00	45.00	7.00	180.00	Center	Surge Arrester	
17	Arm 2	45.00	45.00	20.00	180.00	Center	Surge Arrester	
18	Arm 2	45.00	45.00	33.00	180.00	Center	Surge Arrester	
19	Left	30.00	30.00	1.50	90.00	Left	Flood Light	
20	Center	30.00	30.00	1.50	90.00	Center	Flood Light	

Notes:

1. Load Eccentricity is defined as the distance along the member's axis.

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*** INPUT LOADS LOCATIONS ***

Loading Case 1TC1 NESC Heavy - Continued

Orientation of System

Load Number	Mounted To	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Measured From	Description	N
21	Right	30.00	30.00	1.50	90.00	Right	Flood Light	
22	Left	30.00	30.00	1.50	270.00	Left	Flood Light	
23	Center	30.00	30.00	1.50	270.00	Center	Flood Light	
24	Right	30.00	30.00	1.50	270.00	Right	Flood Light	
25	Arm 3	32.00	32.00	7.00	180.00	Right	Vee-Switch Back	
26	Arm 3	32.00	32.00	20.00	180.00	Right	Vee-Switch Back	
27	Arm 3	32.00	32.00	33.00	180.00	Right	Vee-Switch Back	
28	Arm 4	32.00	32.00	7.00	180.00	Center	Vee-Switch Back	
29	Arm 4	32.00	32.00	20.00	180.00	Center	Vee-Switch Back	
30	Arm 4	32.00	32.00	33.00	180.00	Center	Vee-Switch Back	
31	Arm 5	21.25	21.25	7.00	180.00	Right	Insulator Back	
32	Arm 5	21.25	21.25	20.00	180.00	Right	Insulator Back	
33	Arm 5	21.25	21.25	33.00	180.00	Right	Insulator Back	
34	Arm 6	21.25	21.25	7.00	180.00	Center	Insulator Back	
35	Arm 6	21.25	21.25	20.00	180.00	Center	Insulator Back	
36	Arm 6	21.25	21.25	33.00	180.00	Center	Insulator Back	
37	Arm 5	21.25	21.25	7.00	180.00	Right	Insulator Inv	
38	Arm 5	21.25	21.25	20.00	180.00	Right	Insulator Inv	
39	Arm 5	21.25	21.25	33.00	180.00	Right	Insulator Inv	

Notes:

1. Load Eccentricity is defined as the distance along the member's axis.

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*** INPUT LOADS LOCATIONS ***

Loading Case 1TC1 NESC Heavy - Continued

Load Number	Mounted To	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Measured From	Description	Orientation of System
								N
40	Arm 6	21.25	21.25	7.00	180.00	Center	Insulator Inv	
41	Arm 6	21.25	21.25	20.00	180.00	Center	Insulator Inv	
42	Arm 6	21.25	21.25	33.00	180.00	Center	Insulator Inv	

Notes:

1. Load Eccentricity is defined as the distance along the member's axis.

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*** INPUT LOADS ***

Loading Case 1TC1 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	28	0	81	0.00	-1.69	0.00	Spike
2	28	0	81	0.00	-1.69	0.00	Spike
3	28	0	81	0.00	-1.69	0.00	Spike
4	700	2600	1200	0.00	0.00	0.00	OPGW
5	700	2600	1200	0.00	0.00	0.00	OPGW
6	700	2600	1200	0.00	0.00	0.00	OPGW
7	2400	13600	5000	0.00	0.00	0.00	Conductor
8	2400	13600	5000	0.00	0.00	0.00	Conductor
9	2400	13600	5000	0.00	0.00	0.00	Conductor
10	2400	13600	5000	0.00	0.00	0.00	Conductor
11	2400	13600	5000	0.00	0.00	0.00	Conductor
12	2400	13600	5000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	103	0	239	0.00	-1.55	0.00	Flood Light

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*** INPUT LOADS ***

Loading Case 1TC1 NESC Heavy - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	103	0	239	0.00	-1.55	0.00	Flood Light
21	103	0	239	0.00	-1.55	0.00	Flood Light
22	103	0	239	0.00	-1.55	0.00	Flood Light
23	103	0	239	0.00	-1.55	0.00	Flood Light
24	103	0	239	0.00	-1.55	0.00	Flood Light
25	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
26	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
27	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
28	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
29	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
30	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
31	56	0	584	-18.11	0.00	1.74	Insulator Back
32	56	0	584	-18.11	0.00	1.74	Insulator Back
33	56	0	584	-18.11	0.00	1.74	Insulator Back
34	56	0	584	-18.11	0.00	1.74	Insulator Back
35	56	0	584	-18.11	0.00	1.74	Insulator Back
36	56	0	584	-18.11	0.00	1.74	Insulator Back
37	56	0	584	0.00	1.74	0.00	Insulator Inv
38	56	0	584	0.00	1.74	0.00	Insulator Inv
39	56	0	584	0.00	1.74	0.00	Insulator Inv
40	56	0	584	0.00	1.74	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 1TC1 NESC Heavy - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	56	0	584	0.00	1.74	0.00	Insulator Inv
42	56	0	584	0.00	1.74	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
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GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 1LC1 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	28	81	1.69	0.00	0.00	Spike
2	0	28	81	1.69	0.00	0.00	Spike
3	0	28	81	1.69	0.00	0.00	Spike
4	700	2600	1200	0.00	0.00	0.00	OPGW
5	700	2600	1200	0.00	0.00	0.00	OPGW
6	700	2600	1200	0.00	0.00	0.00	OPGW
7	2400	13600	5000	0.00	0.00	0.00	Conductor
8	2400	13600	5000	0.00	0.00	0.00	Conductor
9	2400	13600	5000	0.00	0.00	0.00	Conductor
10	2400	13600	5000	0.00	0.00	0.00	Conductor
11	2400	13600	5000	0.00	0.00	0.00	Conductor
12	2400	13600	5000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	103	239	1.55	0.00	0.00	Flood Light

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*** INPUT LOADS ***

Loading Case 1LC1 NESC Heavy - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	103	239	1.55	0.00	0.00	Flood Light
21	0	103	239	1.55	0.00	0.00	Flood Light
22	0	103	239	1.55	0.00	0.00	Flood Light
23	0	103	239	1.55	0.00	0.00	Flood Light
24	0	103	239	1.55	0.00	0.00	Flood Light
25	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
26	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
27	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
28	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
29	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
30	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
31	0	0	584	-18.11	0.00	0.00	Insulator Back
32	0	0	584	-18.11	0.00	0.00	Insulator Back
33	0	0	584	-18.11	0.00	0.00	Insulator Back
34	0	0	584	-18.11	0.00	0.00	Insulator Back
35	0	0	584	-18.11	0.00	0.00	Insulator Back
36	0	0	584	-18.11	0.00	0.00	Insulator Back
37	0	56	584	-1.74	0.00	0.00	Insulator Inv
38	0	56	584	-1.74	0.00	0.00	Insulator Inv
39	0	56	584	-1.74	0.00	0.00	Insulator Inv
40	0	56	584	-1.74	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 1LC1 NESC Heavy - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	0	56	584	-1.74	0.00	0.00	Insulator Inv
42	0	56	584	-1.74	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 1TC2 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	28	0	81	0.00	-1.69	0.00	Spike
2	28	0	81	0.00	-1.69	0.00	Spike
3	28	0	81	0.00	-1.69	0.00	Spike
4	700	2400	300	0.00	0.00	0.00	OPGW
5	700	2400	300	0.00	0.00	0.00	OPGW
6	700	2400	300	0.00	0.00	0.00	OPGW
7	1700	6600	-1100	0.00	0.00	0.00	Conductor
8	1700	6600	-1100	0.00	0.00	0.00	Conductor
9	1700	6600	-1100	0.00	0.00	0.00	Conductor
10	1700	6600	-1100	0.00	0.00	0.00	Conductor
11	1700	6600	-1100	0.00	0.00	0.00	Conductor
12	1700	6600	-1100	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	103	0	239	0.00	-1.55	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 1TC2 NESC Heavy - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	103	0	239	0.00	-1.55	0.00	Flood Light
21	103	0	239	0.00	-1.55	0.00	Flood Light
22	103	0	239	0.00	-1.55	0.00	Flood Light
23	103	0	239	0.00	-1.55	0.00	Flood Light
24	103	0	239	0.00	-1.55	0.00	Flood Light
25	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
26	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
27	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
28	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
29	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
30	121	0	1800	-129.60	0.00	9.44	Vee-Switch Back
31	56	0	584	-18.11	0.00	1.74	Insulator Back
32	56	0	584	-18.11	0.00	1.74	Insulator Back
33	56	0	584	-18.11	0.00	1.74	Insulator Back
34	56	0	584	-18.11	0.00	1.74	Insulator Back
35	56	0	584	-18.11	0.00	1.74	Insulator Back
36	56	0	584	-18.11	0.00	1.74	Insulator Back
37	56	0	584	0.00	1.74	0.00	Insulator Inv
38	56	0	584	0.00	1.74	0.00	Insulator Inv
39	56	0	584	0.00	1.74	0.00	Insulator Inv
40	56	0	584	0.00	1.74	0.00	Insulator Inv

BY VALMONT INDUSTRIES
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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 1TC2 NESC Heavy - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	56	0	584	0.00	1.74	0.00	Insulator Inv
42	56	0	584	0.00	1.74	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 1LC2 NESC Heavy

Basic Wind Pressure is 10.00 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.500
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	28	81	1.69	0.00	0.00	Spike
2	0	28	81	1.69	0.00	0.00	Spike
3	0	28	81	1.69	0.00	0.00	Spike
4	700	2400	300	0.00	0.00	0.00	OPGW
5	700	2400	300	0.00	0.00	0.00	OPGW
6	700	2400	300	0.00	0.00	0.00	OPGW
7	1700	6600	-1100	0.00	0.00	0.00	Conductor
8	1700	6600	-1100	0.00	0.00	0.00	Conductor
9	1700	6600	-1100	0.00	0.00	0.00	Conductor
10	1700	6600	-1100	0.00	0.00	0.00	Conductor
11	1700	6600	-1100	0.00	0.00	0.00	Conductor
12	1700	6600	-1100	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	103	239	1.55	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 1LC2 NESC Heavy - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	103	239	1.55	0.00	0.00	Flood Light
21	0	103	239	1.55	0.00	0.00	Flood Light
22	0	103	239	1.55	0.00	0.00	Flood Light
23	0	103	239	1.55	0.00	0.00	Flood Light
24	0	103	239	1.55	0.00	0.00	Flood Light
25	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
26	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
27	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
28	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
29	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
30	0	50	1800	-129.60	0.00	0.00	Vee-Switch Back
31	0	0	584	-18.11	0.00	0.00	Insulator Back
32	0	0	584	-18.11	0.00	0.00	Insulator Back
33	0	0	584	-18.11	0.00	0.00	Insulator Back
34	0	0	584	-18.11	0.00	0.00	Insulator Back
35	0	0	584	-18.11	0.00	0.00	Insulator Back
36	0	0	584	-18.11	0.00	0.00	Insulator Back
37	0	56	584	-1.74	0.00	0.00	Insulator Inv
38	0	56	584	-1.74	0.00	0.00	Insulator Inv
39	0	56	584	-1.74	0.00	0.00	Insulator Inv
40	0	56	584	-1.74	0.00	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 1LC2 NESC Heavy - Continued

Load Number	Orientation of System						
	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	0	56	584	-1.74	0.00	0.00	Insulator Inv
42	0	56	584	-1.74	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC1 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	80	0	40	0.00	-4.80	0.00	Spike
2	80	0	40	0.00	-4.80	0.00	Spike
3	80	0	40	0.00	-4.80	0.00	Spike
4	500	1400	700	0.00	0.00	0.00	OPGW
5	500	1400	700	0.00	0.00	0.00	OPGW
6	500	1400	700	0.00	0.00	0.00	OPGW
7	2200	8400	3000	0.00	0.00	0.00	Conductor
8	2200	8400	3000	0.00	0.00	0.00	Conductor
9	2200	8400	3000	0.00	0.00	0.00	Conductor
10	2200	8400	3000	0.00	0.00	0.00	Conductor
11	2200	8400	3000	0.00	0.00	0.00	Conductor
12	2200	8400	3000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	404	0	110	0.00	-6.06	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2TC1 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	404	0	110	0.00	-6.06	0.00	Flood Light
21	404	0	110	0.00	-6.06	0.00	Flood Light
22	404	0	110	0.00	-6.06	0.00	Flood Light
23	404	0	110	0.00	-6.06	0.00	Flood Light
24	404	0	110	0.00	-6.06	0.00	Flood Light
25	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
26	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
27	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
28	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
29	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
30	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
31	209	0	385	-11.94	0.00	6.47	Insulator Back
32	209	0	385	-11.94	0.00	6.47	Insulator Back
33	209	0	385	-11.94	0.00	6.47	Insulator Back
34	209	0	385	-11.94	0.00	6.47	Insulator Back
35	209	0	385	-11.94	0.00	6.47	Insulator Back
36	209	0	385	-11.94	0.00	6.47	Insulator Back
37	209	0	385	0.00	6.47	0.00	Insulator Inv
38	209	0	385	0.00	6.47	0.00	Insulator Inv
39	209	0	385	0.00	6.47	0.00	Insulator Inv
40	209	0	385	0.00	6.47	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 2TC1 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	209	0	385	0.00	6.47	0.00	Insulator Inv
42	209	0	385	0.00	6.47	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2LC1 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	80	40	4.80	0.00	0.00	Spike
2	0	80	40	4.80	0.00	0.00	Spike
3	0	80	40	4.80	0.00	0.00	Spike
4	500	1400	700	0.00	0.00	0.00	OPGW
5	500	1400	700	0.00	0.00	0.00	OPGW
6	500	1400	700	0.00	0.00	0.00	OPGW
7	2200	8400	3000	0.00	0.00	0.00	Conductor
8	2200	8400	3000	0.00	0.00	0.00	Conductor
9	2200	8400	3000	0.00	0.00	0.00	Conductor
10	2200	8400	3000	0.00	0.00	0.00	Conductor
11	2200	8400	3000	0.00	0.00	0.00	Conductor
12	2200	8400	3000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	404	110	6.06	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2LC1 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	404	110	6.06	0.00	0.00	Flood Light
21	0	404	110	6.06	0.00	0.00	Flood Light
22	0	404	110	6.06	0.00	0.00	Flood Light
23	0	404	110	6.06	0.00	0.00	Flood Light
24	0	404	110	6.06	0.00	0.00	Flood Light
25	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
26	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
27	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
28	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
29	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
30	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
31	0	0	385	-11.94	0.00	0.00	Insulator Back
32	0	0	385	-11.94	0.00	0.00	Insulator Back
33	0	0	385	-11.94	0.00	0.00	Insulator Back
34	0	0	385	-11.94	0.00	0.00	Insulator Back
35	0	0	385	-11.94	0.00	0.00	Insulator Back
36	0	0	385	-11.94	0.00	0.00	Insulator Back
37	0	209	385	-6.47	0.00	0.00	Insulator Inv
38	0	209	385	-6.47	0.00	0.00	Insulator Inv
39	0	209	385	-6.47	0.00	0.00	Insulator Inv
40	0	209	385	-6.47	0.00	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 2LC1 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	0	209	385	-6.47	0.00	0.00	Insulator Inv
42	0	209	385	-6.47	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 2TC2 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	80	0	40	0.00	-4.80	0.00	Spike
2	80	0	40	0.00	-4.80	0.00	Spike
3	80	0	40	0.00	-4.80	0.00	Spike
4	400	1100	200	0.00	0.00	0.00	OPGW
5	400	1100	200	0.00	0.00	0.00	OPGW
6	400	1100	200	0.00	0.00	0.00	OPGW
7	1100	3900	-1000	0.00	0.00	0.00	Conductor
8	1100	3900	-1000	0.00	0.00	0.00	Conductor
9	1100	3900	-1000	0.00	0.00	0.00	Conductor
10	1100	3900	-1000	0.00	0.00	0.00	Conductor
11	1100	3900	-1000	0.00	0.00	0.00	Conductor
12	1100	3900	-1000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	404	0	110	0.00	-6.06	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC2 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	404	0	110	0.00	-6.06	0.00	Flood Light
21	404	0	110	0.00	-6.06	0.00	Flood Light
22	404	0	110	0.00	-6.06	0.00	Flood Light
23	404	0	110	0.00	-6.06	0.00	Flood Light
24	404	0	110	0.00	-6.06	0.00	Flood Light
25	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
26	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
27	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
28	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
29	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
30	421	0	880	-63.36	0.00	32.46	Vee-Switch Back
31	209	0	385	-11.94	0.00	6.47	Insulator Back
32	209	0	385	-11.94	0.00	6.47	Insulator Back
33	209	0	385	-11.94	0.00	6.47	Insulator Back
34	209	0	385	-11.94	0.00	6.47	Insulator Back
35	209	0	385	-11.94	0.00	6.47	Insulator Back
36	209	0	385	-11.94	0.00	6.47	Insulator Back
37	209	0	385	0.00	6.47	0.00	Insulator Inv
38	209	0	385	0.00	6.47	0.00	Insulator Inv
39	209	0	385	0.00	6.47	0.00	Insulator Inv
40	209	0	385	0.00	6.47	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2TC2 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	209	0	385	0.00	6.47	0.00	Insulator Inv
42	209	0	385	0.00	6.47	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC2 Extreme Wind

Basic Wind Pressure is 40.37 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.100
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	80	40	4.80	0.00	0.00	Spike
2	0	80	40	4.80	0.00	0.00	Spike
3	0	80	40	4.80	0.00	0.00	Spike
4	400	1100	200	0.00	0.00	0.00	OPGW
5	400	1100	200	0.00	0.00	0.00	OPGW
6	400	1100	200	0.00	0.00	0.00	OPGW
7	1100	3900	-1000	0.00	0.00	0.00	Conductor
8	1100	3900	-1000	0.00	0.00	0.00	Conductor
9	1100	3900	-1000	0.00	0.00	0.00	Conductor
10	1100	3900	-1000	0.00	0.00	0.00	Conductor
11	1100	3900	-1000	0.00	0.00	0.00	Conductor
12	1100	3900	-1000	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	404	110	6.06	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC2 Extreme Wind - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	404	110	6.06	0.00	0.00	Flood Light
21	0	404	110	6.06	0.00	0.00	Flood Light
22	0	404	110	6.06	0.00	0.00	Flood Light
23	0	404	110	6.06	0.00	0.00	Flood Light
24	0	404	110	6.06	0.00	0.00	Flood Light
25	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
26	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
27	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
28	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
29	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
30	0	179	880	-63.36	0.00	0.00	Vee-Switch Back
31	0	0	385	-11.94	0.00	0.00	Insulator Back
32	0	0	385	-11.94	0.00	0.00	Insulator Back
33	0	0	385	-11.94	0.00	0.00	Insulator Back
34	0	0	385	-11.94	0.00	0.00	Insulator Back
35	0	0	385	-11.94	0.00	0.00	Insulator Back
36	0	0	385	-11.94	0.00	0.00	Insulator Back
37	0	209	385	-6.47	0.00	0.00	Insulator Inv
38	0	209	385	-6.47	0.00	0.00	Insulator Inv
39	0	209	385	-6.47	0.00	0.00	Insulator Inv
40	0	209	385	-6.47	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 2LC2 Extreme Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	0	209	385	-6.47	0.00	0.00	Insulator Inv
42	0	209	385	-6.47	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C1 Extreme Ice

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.100

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	101	0.00	0.00	0.00	Spike
2	0	0	101	0.00	0.00	0.00	Spike
3	0	0	101	0.00	0.00	0.00	Spike
4	400	2300	1500	0.00	0.00	0.00	OPGW
5	400	2300	1500	0.00	0.00	0.00	OPGW
6	400	2300	1500	0.00	0.00	0.00	OPGW
7	1600	11600	4900	0.00	0.00	0.00	Conductor
8	1600	11600	4900	0.00	0.00	0.00	Conductor
9	1600	11600	4900	0.00	0.00	0.00	Conductor
10	1600	11600	4900	0.00	0.00	0.00	Conductor
11	1600	11600	4900	0.00	0.00	0.00	Conductor
12	1600	11600	4900	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	0	277	0.00	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C1 Extreme Ice - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	277	0.00	0.00	0.00	Flood Light
21	0	0	277	0.00	0.00	0.00	Flood Light
22	0	0	277	0.00	0.00	0.00	Flood Light
23	0	0	277	0.00	0.00	0.00	Flood Light
24	0	0	277	0.00	0.00	0.00	Flood Light
25	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
26	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
27	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
28	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
29	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
30	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
31	0	0	500	-15.50	0.00	0.00	Insulator Back
32	0	0	500	-15.50	0.00	0.00	Insulator Back
33	0	0	500	-15.50	0.00	0.00	Insulator Back
34	0	0	500	-15.50	0.00	0.00	Insulator Back
35	0	0	500	-15.50	0.00	0.00	Insulator Back
36	0	0	500	-15.50	0.00	0.00	Insulator Back
37	0	0	500	0.00	0.00	0.00	Insulator Inv
38	0	0	500	0.00	0.00	0.00	Insulator Inv
39	0	0	500	0.00	0.00	0.00	Insulator Inv
40	0	0	500	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C1 Extreme Ice - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	0	0	500	0.00	0.00	0.00	Insulator Inv
42	0	0	500	0.00	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C2 Extreme Ice

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.100

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	101	0.00	0.00	0.00	Spike
2	0	0	101	0.00	0.00	0.00	Spike
3	0	0	101	0.00	0.00	0.00	Spike
4	600	2300	400	0.00	0.00	0.00	OPGW
5	600	2300	400	0.00	0.00	0.00	OPGW
6	600	2300	400	0.00	0.00	0.00	OPGW
7	1200	5900	-1200	0.00	0.00	0.00	Conductor
8	1200	5900	-1200	0.00	0.00	0.00	Conductor
9	1200	5900	-1200	0.00	0.00	0.00	Conductor
10	1200	5900	-1200	0.00	0.00	0.00	Conductor
11	1200	5900	-1200	0.00	0.00	0.00	Conductor
12	1200	5900	-1200	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	0	277	0.00	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C2 Extreme Ice - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	277	0.00	0.00	0.00	Flood Light
21	0	0	277	0.00	0.00	0.00	Flood Light
22	0	0	277	0.00	0.00	0.00	Flood Light
23	0	0	277	0.00	0.00	0.00	Flood Light
24	0	0	277	0.00	0.00	0.00	Flood Light
25	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
26	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
27	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
28	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
29	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
30	0	0	1980	-142.56	0.00	0.00	Vee-Switch Back
31	0	0	500	-15.50	0.00	0.00	Insulator Back
32	0	0	500	-15.50	0.00	0.00	Insulator Back
33	0	0	500	-15.50	0.00	0.00	Insulator Back
34	0	0	500	-15.50	0.00	0.00	Insulator Back
35	0	0	500	-15.50	0.00	0.00	Insulator Back
36	0	0	500	-15.50	0.00	0.00	Insulator Back
37	0	0	500	0.00	0.00	0.00	Insulator Inv
38	0	0	500	0.00	0.00	0.00	Insulator Inv
39	0	0	500	0.00	0.00	0.00	Insulator Inv
40	0	0	500	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 3C2 Extreme Ice - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	0	0	500	0.00	0.00	0.00	Insulator Inv
42	0	0	500	0.00	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC1 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	21	0	78	0.00	-1.29	0.00	Spike
2	21	0	78	0.00	-1.29	0.00	Spike
3	21	0	78	0.00	-1.29	0.00	Spike
4	700	2500	1500	0.00	0.00	0.00	OPGW
5	700	2500	1500	0.00	0.00	0.00	OPGW
6	700	2500	1500	0.00	0.00	0.00	OPGW
7	2000	11800	4900	0.00	0.00	0.00	Conductor
8	2000	11800	4900	0.00	0.00	0.00	Conductor
9	2000	11800	4900	0.00	0.00	0.00	Conductor
10	2000	11800	4900	0.00	0.00	0.00	Conductor
11	2000	11800	4900	0.00	0.00	0.00	Conductor
12	2000	11800	4900	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	63	0	221	0.00	-0.94	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4TC1 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	63	0	221	0.00	-0.94	0.00	Flood Light
21	63	0	221	0.00	-0.94	0.00	Flood Light
22	63	0	221	0.00	-0.94	0.00	Flood Light
23	63	0	221	0.00	-0.94	0.00	Flood Light
24	63	0	221	0.00	-0.94	0.00	Flood Light
25	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
26	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
27	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
28	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
29	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
30	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
31	35	0	432	-13.39	0.00	1.10	Insulator Back
32	35	0	432	-13.39	0.00	1.10	Insulator Back
33	35	0	432	-13.39	0.00	1.10	Insulator Back
34	35	0	432	-13.39	0.00	1.10	Insulator Back
35	35	0	432	-13.39	0.00	1.10	Insulator Back
36	35	0	432	-13.39	0.00	1.10	Insulator Back
37	35	0	432	0.00	1.10	0.00	Insulator Inv
38	35	0	432	0.00	1.10	0.00	Insulator Inv
39	35	0	432	0.00	1.10	0.00	Insulator Inv
40	35	0	432	0.00	1.10	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 4TC1 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	35	0	432	0.00	1.10	0.00	Insulator Inv
42	35	0	432	0.00	1.10	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4LC1 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	21	78	1.29	0.00	0.00	Spike
2	0	21	78	1.29	0.00	0.00	Spike
3	0	21	78	1.29	0.00	0.00	Spike
4	700	2500	1500	0.00	0.00	0.00	OPGW
5	700	2500	1500	0.00	0.00	0.00	OPGW
6	700	2500	1500	0.00	0.00	0.00	OPGW
7	2000	11800	4900	0.00	0.00	0.00	Conductor
8	2000	11800	4900	0.00	0.00	0.00	Conductor
9	2000	11800	4900	0.00	0.00	0.00	Conductor
10	2000	11800	4900	0.00	0.00	0.00	Conductor
11	2000	11800	4900	0.00	0.00	0.00	Conductor
12	2000	11800	4900	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	63	221	0.94	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 4LC1 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	63	221	0.94	0.00	0.00	Flood Light
21	0	63	221	0.94	0.00	0.00	Flood Light
22	0	63	221	0.94	0.00	0.00	Flood Light
23	0	63	221	0.94	0.00	0.00	Flood Light
24	0	63	221	0.94	0.00	0.00	Flood Light
25	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
26	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
27	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
28	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
29	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
30	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
31	0	0	432	-13.39	0.00	0.00	Insulator Back
32	0	0	432	-13.39	0.00	0.00	Insulator Back
33	0	0	432	-13.39	0.00	0.00	Insulator Back
34	0	0	432	-13.39	0.00	0.00	Insulator Back
35	0	0	432	-13.39	0.00	0.00	Insulator Back
36	0	0	432	-13.39	0.00	0.00	Insulator Back
37	0	35	432	-1.10	0.00	0.00	Insulator Inv
38	0	35	432	-1.10	0.00	0.00	Insulator Inv
39	0	35	432	-1.10	0.00	0.00	Insulator Inv
40	0	35	432	-1.10	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 4LC1 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	0	35	432	-1.10	0.00	0.00	Insulator Inv
42	0	35	432	-1.10	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 4TC2 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	21	0	78	0.00	-1.29	0.00	Spike
2	21	0	78	0.00	-1.29	0.00	Spike
3	21	0	78	0.00	-1.29	0.00	Spike
4	700	2400	400	0.00	0.00	0.00	OPGW
5	700	2400	400	0.00	0.00	0.00	OPGW
6	700	2400	400	0.00	0.00	0.00	OPGW
7	1400	6100	-1300	0.00	0.00	0.00	Conductor
8	1400	6100	-1300	0.00	0.00	0.00	Conductor
9	1400	6100	-1300	0.00	0.00	0.00	Conductor
10	1400	6100	-1300	0.00	0.00	0.00	Conductor
11	1400	6100	-1300	0.00	0.00	0.00	Conductor
12	1400	6100	-1300	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	63	0	221	0.00	-0.94	0.00	Flood Light

BY VALMONT INDUSTRIES
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*** INPUT LOADS ***

Loading Case 4TC2 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	63	0	221	0.00	-0.94	0.00	Flood Light
21	63	0	221	0.00	-0.94	0.00	Flood Light
22	63	0	221	0.00	-0.94	0.00	Flood Light
23	63	0	221	0.00	-0.94	0.00	Flood Light
24	63	0	221	0.00	-0.94	0.00	Flood Light
25	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
26	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
27	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
28	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
29	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
30	81	0	1600	-115.20	0.00	6.36	Vee-Switch Back
31	35	0	432	-13.39	0.00	1.10	Insulator Back
32	35	0	432	-13.39	0.00	1.10	Insulator Back
33	35	0	432	-13.39	0.00	1.10	Insulator Back
34	35	0	432	-13.39	0.00	1.10	Insulator Back
35	35	0	432	-13.39	0.00	1.10	Insulator Back
36	35	0	432	-13.39	0.00	1.10	Insulator Back
37	35	0	432	0.00	1.10	0.00	Insulator Inv
38	35	0	432	0.00	1.10	0.00	Insulator Inv
39	35	0	432	0.00	1.10	0.00	Insulator Inv
40	35	0	432	0.00	1.10	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 4TC2 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	35	0	432	0.00	1.10	0.00	Insulator Inv
42	35	0	432	0.00	1.10	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 4LC2 Ice and Wind

Basic Wind Pressure is 5.87 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	21	78	1.29	0.00	0.00	Spike
2	0	21	78	1.29	0.00	0.00	Spike
3	0	21	78	1.29	0.00	0.00	Spike
4	700	2400	400	0.00	0.00	0.00	OPGW
5	700	2400	400	0.00	0.00	0.00	OPGW
6	700	2400	400	0.00	0.00	0.00	OPGW
7	1400	6100	-1300	0.00	0.00	0.00	Conductor
8	1400	6100	-1300	0.00	0.00	0.00	Conductor
9	1400	6100	-1300	0.00	0.00	0.00	Conductor
10	1400	6100	-1300	0.00	0.00	0.00	Conductor
11	1400	6100	-1300	0.00	0.00	0.00	Conductor
12	1400	6100	-1300	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	63	221	0.94	0.00	0.00	Flood Light

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*** INPUT LOADS ***

Loading Case 4LC2 Ice and Wind - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	63	221	0.94	0.00	0.00	Flood Light
21	0	63	221	0.94	0.00	0.00	Flood Light
22	0	63	221	0.94	0.00	0.00	Flood Light
23	0	63	221	0.94	0.00	0.00	Flood Light
24	0	63	221	0.94	0.00	0.00	Flood Light
25	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
26	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
27	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
28	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
29	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
30	0	33	1600	-115.20	0.00	0.00	Vee-Switch Back
31	0	0	432	-13.39	0.00	0.00	Insulator Back
32	0	0	432	-13.39	0.00	0.00	Insulator Back
33	0	0	432	-13.39	0.00	0.00	Insulator Back
34	0	0	432	-13.39	0.00	0.00	Insulator Back
35	0	0	432	-13.39	0.00	0.00	Insulator Back
36	0	0	432	-13.39	0.00	0.00	Insulator Back
37	0	35	432	-1.10	0.00	0.00	Insulator Inv
38	0	35	432	-1.10	0.00	0.00	Insulator Inv
39	0	35	432	-1.10	0.00	0.00	Insulator Inv
40	0	35	432	-1.10	0.00	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 4LC2 Ice and Wind - Continued

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	Orientation of System
41	0	35	432	-1.10	0.00	0.00	Insulator Inv
42	0	35	432	-1.10	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
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GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 5TC1 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	47	0	37	0.00	-2.80	0.00	Spike
2	47	0	37	0.00	-2.80	0.00	Spike
3	47	0	37	0.00	-2.80	0.00	Spike
4	100	400	500	0.00	0.00	0.00	OPGW
5	100	400	500	0.00	0.00	0.00	OPGW
6	100	400	500	0.00	0.00	0.00	OPGW
7	500	3800	2600	0.00	0.00	0.00	Conductor
8	500	3800	2600	0.00	0.00	0.00	Conductor
9	500	3800	2600	0.00	0.00	0.00	Conductor
10	500	3800	2600	0.00	0.00	0.00	Conductor
11	500	3800	2600	0.00	0.00	0.00	Conductor
12	500	3800	2600	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester

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*** INPUT LOADS ***

Loading Case		5TC1 Deflection - Continued					Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	235	0	100	0.00	-3.53	0.00	Flood Light
20	235	0	100	0.00	-3.53	0.00	Flood Light
21	235	0	100	0.00	-3.53	0.00	Flood Light
22	235	0	100	0.00	-3.53	0.00	Flood Light
23	235	0	100	0.00	-3.53	0.00	Flood Light
24	235	0	100	0.00	-3.53	0.00	Flood Light
25	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
26	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
27	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
28	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
29	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
30	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
31	121	0	350	-10.85	0.00	3.76	Insulator Back
32	121	0	350	-10.85	0.00	3.76	Insulator Back
33	121	0	350	-10.85	0.00	3.76	Insulator Back
34	121	0	350	-10.85	0.00	3.76	Insulator Back
35	121	0	350	-10.85	0.00	3.76	Insulator Back
36	121	0	350	-10.85	0.00	3.76	Insulator Back
37	121	0	350	0.00	3.76	0.00	Insulator Inv
38	121	0	350	0.00	3.76	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 5TC1 Deflection - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
39	121	0	350	0.00	3.76	0.00	Insulator Inv
40	121	0	350	0.00	3.76	0.00	Insulator Inv
41	121	0	350	0.00	3.76	0.00	Insulator Inv
42	121	0	350	0.00	3.76	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
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GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 5LC1 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	47	37	2.80	0.00	0.00	Spike
2	0	47	37	2.80	0.00	0.00	Spike
3	0	47	37	2.80	0.00	0.00	Spike
4	100	400	500	0.00	0.00	0.00	OPGW
5	100	400	500	0.00	0.00	0.00	OPGW
6	100	400	500	0.00	0.00	0.00	OPGW
7	500	3800	2600	0.00	0.00	0.00	Conductor
8	500	3800	2600	0.00	0.00	0.00	Conductor
9	500	3800	2600	0.00	0.00	0.00	Conductor
10	500	3800	2600	0.00	0.00	0.00	Conductor
11	500	3800	2600	0.00	0.00	0.00	Conductor
12	500	3800	2600	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester

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*** INPUT LOADS ***

Loading Case 5LC1 Deflection - Continued							Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	235	100	3.53	0.00	0.00	Flood Light
20	0	235	100	3.53	0.00	0.00	Flood Light
21	0	235	100	3.53	0.00	0.00	Flood Light
22	0	235	100	3.53	0.00	0.00	Flood Light
23	0	235	100	3.53	0.00	0.00	Flood Light
24	0	235	100	3.53	0.00	0.00	Flood Light
25	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
26	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
27	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
28	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
29	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
30	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
31	0	0	350	-10.85	0.00	0.00	Insulator Back
32	0	0	350	-10.85	0.00	0.00	Insulator Back
33	0	0	350	-10.85	0.00	0.00	Insulator Back
34	0	0	350	-10.85	0.00	0.00	Insulator Back
35	0	0	350	-10.85	0.00	0.00	Insulator Back
36	0	0	350	-10.85	0.00	0.00	Insulator Back
37	0	121	350	-3.76	0.00	0.00	Insulator Inv
38	0	121	350	-3.76	0.00	0.00	Insulator Inv

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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5LC1 Deflection - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
39	0	121	350	-3.76	0.00	0.00	Insulator Inv
40	0	121	350	-3.76	0.00	0.00	Insulator Inv
41	0	121	350	-3.76	0.00	0.00	Insulator Inv
42	0	121	350	-3.76	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5TC2 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 0.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	47	0	37	0.00	-2.80	0.00	Spike
2	47	0	37	0.00	-2.80	0.00	Spike
3	47	0	37	0.00	-2.80	0.00	Spike
4	100	300	100	0.00	0.00	0.00	OPGW
5	100	300	100	0.00	0.00	0.00	OPGW
6	100	300	100	0.00	0.00	0.00	OPGW
7	400	1900	-300	0.00	0.00	0.00	Conductor
8	400	1900	-300	0.00	0.00	0.00	Conductor
9	400	1900	-300	0.00	0.00	0.00	Conductor
10	400	1900	-300	0.00	0.00	0.00	Conductor
11	400	1900	-300	0.00	0.00	0.00	Conductor
12	400	1900	-300	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case		5TC2 Deflection - Continued					Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	235	0	100	0.00	-3.53	0.00	Flood Light
20	235	0	100	0.00	-3.53	0.00	Flood Light
21	235	0	100	0.00	-3.53	0.00	Flood Light
22	235	0	100	0.00	-3.53	0.00	Flood Light
23	235	0	100	0.00	-3.53	0.00	Flood Light
24	235	0	100	0.00	-3.53	0.00	Flood Light
25	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
26	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
27	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
28	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
29	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
30	245	0	800	-57.60	0.00	18.90	Vee-Switch Back
31	121	0	350	-10.85	0.00	3.76	Insulator Back
32	121	0	350	-10.85	0.00	3.76	Insulator Back
33	121	0	350	-10.85	0.00	3.76	Insulator Back
34	121	0	350	-10.85	0.00	3.76	Insulator Back
35	121	0	350	-10.85	0.00	3.76	Insulator Back
36	121	0	350	-10.85	0.00	3.76	Insulator Back
37	121	0	350	0.00	3.76	0.00	Insulator Inv
38	121	0	350	0.00	3.76	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5TC2 Deflection - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
39	121	0	350	0.00	3.76	0.00	Insulator Inv
40	121	0	350	0.00	3.76	0.00	Insulator Inv
41	121	0	350	0.00	3.76	0.00	Insulator Inv
42	121	0	350	0.00	3.76	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

*** INPUT LOADS ***

Loading Case 5LC2 Deflection

Basic Wind Pressure is 23.50 psf
Wind Orientation is 90.0 Degrees Clockwise From +X Axis
Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90
Structure Weight Overload Factor is 1.000
Orientations are Measured Clockwise From +X Axis
Positive Y Axis is 90 Degrees Clockwise From +X Axis
Deflection Limitation: 7.8 in, 1% of Pole Height

Orientation of System
+***** +X-Axis
* * (Transverse)
* *
* *
(Longitudinal) * * (Vertical)
+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	47	37	2.80	0.00	0.00	Spike
2	0	47	37	2.80	0.00	0.00	Spike
3	0	47	37	2.80	0.00	0.00	Spike
4	100	300	100	0.00	0.00	0.00	OPGW
5	100	300	100	0.00	0.00	0.00	OPGW
6	100	300	100	0.00	0.00	0.00	OPGW
7	400	1900	-300	0.00	0.00	0.00	Conductor
8	400	1900	-300	0.00	0.00	0.00	Conductor
9	400	1900	-300	0.00	0.00	0.00	Conductor
10	400	1900	-300	0.00	0.00	0.00	Conductor
11	400	1900	-300	0.00	0.00	0.00	Conductor
12	400	1900	-300	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case		5LC2 Deflection - Continued					Orientation of System
Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	235	100	3.53	0.00	0.00	Flood Light
20	0	235	100	3.53	0.00	0.00	Flood Light
21	0	235	100	3.53	0.00	0.00	Flood Light
22	0	235	100	3.53	0.00	0.00	Flood Light
23	0	235	100	3.53	0.00	0.00	Flood Light
24	0	235	100	3.53	0.00	0.00	Flood Light
25	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
26	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
27	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
28	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
29	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
30	0	104	800	-57.60	0.00	0.00	Vee-Switch Back
31	0	0	350	-10.85	0.00	0.00	Insulator Back
32	0	0	350	-10.85	0.00	0.00	Insulator Back
33	0	0	350	-10.85	0.00	0.00	Insulator Back
34	0	0	350	-10.85	0.00	0.00	Insulator Back
35	0	0	350	-10.85	0.00	0.00	Insulator Back
36	0	0	350	-10.85	0.00	0.00	Insulator Back
37	0	121	350	-3.76	0.00	0.00	Insulator Inv
38	0	121	350	-3.76	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 5LC2 Deflection - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
39	0	121	350	-3.76	0.00	0.00	Insulator Inv
40	0	121	350	-3.76	0.00	0.00	Insulator Inv
41	0	121	350	-3.76	0.00	0.00	Insulator Inv
42	0	121	350	-3.76	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.000

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	37	0.00	0.00	0.00	Spike
2	0	0	37	0.00	0.00	0.00	Spike
3	0	0	37	0.00	0.00	0.00	Spike
4	700	200	1600	0.00	0.00	0.00	OPGW
5	700	200	1600	0.00	0.00	0.00	OPGW
6	700	200	1600	0.00	0.00	0.00	OPGW
7	1700	500	5700	0.00	0.00	0.00	Conductor
8	1700	500	5700	0.00	0.00	0.00	Conductor
9	1700	500	5700	0.00	0.00	0.00	Conductor
10	1700	500	5700	0.00	0.00	0.00	Conductor
11	1700	500	5700	0.00	0.00	0.00	Conductor
12	1700	500	5700	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	0	100	0.00	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	100	0.00	0.00	0.00	Flood Light
21	0	0	100	0.00	0.00	0.00	Flood Light
22	0	0	100	0.00	0.00	0.00	Flood Light
23	0	0	100	0.00	0.00	0.00	Flood Light
24	0	0	100	0.00	0.00	0.00	Flood Light
25	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
26	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
27	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
28	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
29	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
30	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
31	0	0	350	-10.85	0.00	0.00	Insulator Back
32	0	0	350	-10.85	0.00	0.00	Insulator Back
33	0	0	350	-10.85	0.00	0.00	Insulator Back
34	0	0	350	-10.85	0.00	0.00	Insulator Back
35	0	0	350	-10.85	0.00	0.00	Insulator Back
36	0	0	350	-10.85	0.00	0.00	Insulator Back
37	0	0	350	0.00	0.00	0.00	Insulator Inv
38	0	0	350	0.00	0.00	0.00	Insulator Inv
39	0	0	350	0.00	0.00	0.00	Insulator Inv
40	0	0	350	0.00	0.00	0.00	Insulator Inv

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Load Number	Orientation of System						
	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	0	0	350	0.00	0.00	0.00	Insulator Inv
42	0	0	350	0.00	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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*** INPUT LOADS ***

Loading Case 6 Construction

No Wind

Drag Factor: 4 = 2.00, 6 = 1.40, 8 = 1.40, 12 = 1.00, 16 = 0.90, Round = 0.90

Structure Weight Overload Factor is 1.000

Orientations are Measured Clockwise From +X Axis

Positive Y Axis is 90 Degrees Clockwise From +X Axis

Orientation of System

+***** +X-Axis

* * (Transverse)

* *

* *

(Longitudinal) * * (Vertical)

+Y-Axis * * +Z-Axis

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
1	0	0	37	0.00	0.00	0.00	Spike
2	0	0	37	0.00	0.00	0.00	Spike
3	0	0	37	0.00	0.00	0.00	Spike
4	200	600	100	0.00	0.00	0.00	OPGW
5	200	600	100	0.00	0.00	0.00	OPGW
6	200	600	100	0.00	0.00	0.00	OPGW
7	700	3000	-600	0.00	0.00	0.00	Conductor
8	700	3000	-600	0.00	0.00	0.00	Conductor
9	700	3000	-600	0.00	0.00	0.00	Conductor
10	700	3000	-600	0.00	0.00	0.00	Conductor
11	700	3000	-600	0.00	0.00	0.00	Conductor
12	700	3000	-600	0.00	0.00	0.00	Conductor
13	0	0	0	0.00	0.00	0.00	Surge Arrester
14	0	0	0	0.00	0.00	0.00	Surge Arrester
15	0	0	0	0.00	0.00	0.00	Surge Arrester
16	0	0	0	0.00	0.00	0.00	Surge Arrester
17	0	0	0	0.00	0.00	0.00	Surge Arrester
18	0	0	0	0.00	0.00	0.00	Surge Arrester
19	0	0	100	0.00	0.00	0.00	Flood Light

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Orientation of System

Load Number	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
20	0	0	100	0.00	0.00	0.00	Flood Light
21	0	0	100	0.00	0.00	0.00	Flood Light
22	0	0	100	0.00	0.00	0.00	Flood Light
23	0	0	100	0.00	0.00	0.00	Flood Light
24	0	0	100	0.00	0.00	0.00	Flood Light
25	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
26	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
27	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
28	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
29	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
30	0	0	800	-57.60	0.00	0.00	Vee-Switch Back
31	0	0	350	-10.85	0.00	0.00	Insulator Back
32	0	0	350	-10.85	0.00	0.00	Insulator Back
33	0	0	350	-10.85	0.00	0.00	Insulator Back
34	0	0	350	-10.85	0.00	0.00	Insulator Back
35	0	0	350	-10.85	0.00	0.00	Insulator Back
36	0	0	350	-10.85	0.00	0.00	Insulator Back
37	0	0	350	0.00	0.00	0.00	Insulator Inv
38	0	0	350	0.00	0.00	0.00	Insulator Inv
39	0	0	350	0.00	0.00	0.00	Insulator Inv
40	0	0	350	0.00	0.00	0.00	Insulator Inv

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*** INPUT LOADS ***

Loading Case 6 Construction - Continued

Load Number	Orientation of System						
	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	Moment-X (in-kips)	Moment-Y (in-kips)	Moment-Z (in-kips)	
41	0	0	350	0.00	0.00	0.00	Insulator Inv
42	0	0	350	0.00	0.00	0.00	Insulator Inv

FOR APPROVAL

BY VALMONT INDUSTRIES
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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** Left Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 2	65.00	22.000	0.2500	88.00	20.90	1059	17.48
	60.00	23.231	0.2500	92.92	22.22	1249	18.47
	55.00	24.462	0.2500	97.85	23.54	1460	19.46
	50.00	25.692	0.2500	102.77	24.86	1694	20.45
	48.00	26.185	0.2500	104.74	25.39	1795	20.85
Top of Sect 1	48.00	26.185	0.3750	69.83	16.03	2654	31.12
Start of Sect 1	45.00	26.923	0.3750	71.80	16.56	2888	32.01
	40.00	28.154	0.3750	75.08	17.44	3308	33.50
	35.00	29.385	0.3750	78.36	18.32	3768	34.98
Start of Sect 1	32.00	30.123	0.3750	80.33	18.84	4063	35.87
	30.00	30.616	0.3750	81.64	19.20	4268	36.46
	25.00	31.846	0.3750	84.92	20.08	4811	37.95
Start of Sect 1	21.25	32.769	0.3750	87.38	20.74	5247	39.06
	20.00	33.077	0.3750	88.21	20.96	5397	39.43
	15.00	34.308	0.3750	91.49	21.83	6030	40.92
	10.00	35.539	0.3750	94.77	22.71	6710	42.40
	5.00	36.769	0.3750	98.05	23.59	7440	43.88
Base of Sect 1	0.00	38.000	0.3750	101.33	24.47	8220	45.37

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** Center Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 2	65.00	22.000	0.2500	88.00	20.90	1059	17.48
	60.00	23.231	0.2500	92.92	22.22	1249	18.47
	55.00	24.462	0.2500	97.85	23.54	1460	19.46
	50.00	25.692	0.2500	102.77	24.86	1694	20.45
	48.00	26.185	0.2500	104.74	25.39	1795	20.85
Top of Sect 1	48.00	26.185	0.3750	69.83	16.03	2654	31.12
End of Sect 1	45.00	26.923	0.3750	71.80	16.56	2888	32.01
	40.00	28.154	0.3750	75.08	17.44	3308	33.50
	35.00	29.385	0.3750	78.36	18.32	3768	34.98
End of Sect 1	32.00	30.123	0.3750	80.33	18.84	4063	35.87
	30.00	30.616	0.3750	81.64	19.20	4268	36.46
	25.00	31.846	0.3750	84.92	20.08	4811	37.95
End of Sect 1	21.25	32.769	0.3750	87.38	20.74	5247	39.06
	20.00	33.077	0.3750	88.21	20.96	5397	39.43
	15.00	34.308	0.3750	91.49	21.83	6030	40.92
	10.00	35.539	0.3750	94.77	22.71	6710	42.40
	5.00	36.769	0.3750	98.05	23.59	7440	43.88
Base of Sect 1	0.00	38.000	0.3750	101.33	24.47	8220	45.37

BY VALMONT INDUSTRIES
Design Id: Item_36

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*** Right Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Top of Sect 2	65.00	22.000	0.2500	88.00	20.90	1059	17.48
	60.00	23.231	0.2500	92.92	22.22	1249	18.47
	55.00	24.462	0.2500	97.85	23.54	1460	19.46
	50.00	25.692	0.2500	102.77	24.86	1694	20.45
	48.00	26.185	0.2500	104.74	25.39	1795	20.85
Top of Sect 1	48.00	26.185	0.3750	69.83	16.03	2654	31.12
End of Sect 1	45.00	26.923	0.3750	71.80	16.56	2888	32.01
	40.00	28.154	0.3750	75.08	17.44	3308	33.50
	35.00	29.385	0.3750	78.36	18.32	3768	34.98
End of Sect 1	32.00	30.123	0.3750	80.33	18.84	4063	35.87
	30.00	30.616	0.3750	81.64	19.20	4268	36.46
	25.00	31.846	0.3750	84.92	20.08	4811	37.95
End of Sect 1	21.25	32.769	0.3750	87.38	20.74	5247	39.06
	20.00	33.077	0.3750	88.21	20.96	5397	39.43
	15.00	34.308	0.3750	91.49	21.83	6030	40.92
	10.00	35.539	0.3750	94.77	22.71	6710	42.40
Base of Sect 1	5.00	36.769	0.3750	98.05	23.59	7440	43.88
	0.00	38.000	0.3750	101.33	24.47	8220	45.37

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** Arm 1 (Cond BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
End of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

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*** Arm 2 (Cond BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES
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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** Arm 3 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
End of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES
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*** Arm 4 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

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*** Arm 5 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
End of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES
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FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

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*** Arm 6 (Equip BM) Properties ***

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in^4)	Area (in^2)
Start of Sect 1	40.00	18.000	0.2500	72.00	25.68	612	14.70
	37.50	18.000	0.2500	72.00	25.68	612	14.70
	35.00	18.000	0.2500	72.00	25.68	612	14.70
	33.00	18.000	0.2500	72.00	25.68	612	14.70
	30.00	18.000	0.2500	72.00	25.68	612	14.70
	27.50	18.000	0.2500	72.00	25.68	612	14.70
	25.00	18.000	0.2500	72.00	25.68	612	14.70
	22.50	18.000	0.2500	72.00	25.68	612	14.70
	20.00	18.000	0.2500	72.00	25.68	612	14.70
	17.50	18.000	0.2500	72.00	25.68	612	14.70
	15.00	18.000	0.2500	72.00	25.68	612	14.70
	12.50	18.000	0.2500	72.00	25.68	612	14.70
	10.00	18.000	0.2500	72.00	25.68	612	14.70
	7.00	18.000	0.2500	72.00	25.68	612	14.70
	5.00	18.000	0.2500	72.00	25.68	612	14.70
	2.50	18.000	0.2500	72.00	25.68	612	14.70
End of Sect 1	0.00	18.000	0.2500	72.00	25.68	612	14.70

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
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Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	755	2627	2733	1209
60.00	158	-50	166	0	851	2638	2772	1668
55.00	317	-104	333	0	951	2649	2815	2153
50.00	476	-164	503	0	1057	2660	2863	2664
48.00	540	-190	572	0	1101	2665	2884	2874
48.00	540	-190	572	0	1101	2664	2883	2875
45.00	636	-231	677	0	1169	2676	2920	3358
45.00	867	-412	960	1801	-624	24739	24747	9703
40.00	2352	-377	2382	1801	-546	24743	24749	10574
35.00	3837	-347	3853	1801	-451	24744	24748	11487
32.00	4728	-332	4740	1801	-376	24755	24758	12029
32.00	4741	-224	4746	1783	2929	25457	25625	14353
30.00	5352	-295	5360	1783	2980	25464	25638	14722
30.00	5352	-298	5360	1783	3167	25447	25643	15248
25.00	6879	-490	6897	1783	3274	25425	25635	16262
21.25	8024	-640	8049	1783	3376	25437	25660	16999
21.25	8150	-536	8168	1699	6226	25536	26284	18757
20.00	8533	-629	8556	1699	6245	25503	26256	19061
15.00	10064	-1006	10114	1699	6361	25451	26233	20176
10.00	11591	-1391	11675	1699	6481	25389	26203	21333
5.00	13115	-1782	13236	1699	6606	25317	26164	22529
0.00	14634	-2183	14796	1699	6762	25319	26206	23668

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	731	2643	2743	1187
60.00	159	-48	166	0	826	2659	2784	1647
55.00	319	-101	335	0	927	2675	2831	2132
50.00	480	-160	506	0	1032	2691	2882	2642
48.00	545	-185	575	0	1076	2698	2905	2853
48.00	545	-185	575	0	1075	2698	2904	2853
45.00	642	-225	681	0	1143	2714	2945	3336
45.00	183	688	712	-2	9036	41239	42218	20442
40.00	2659	142	2662	-2	9155	41233	42237	21343
35.00	5133	-411	5150	-2	9274	41214	42244	22303
32.00	6617	-746	6659	-2	9350	41230	42277	22845
32.00	5817	152	5819	-7	8604	40015	40929	31371
30.00	6777	-55	6778	-7	8656	40025	40950	31740
30.00	6777	-58	6778	-6	8861	39959	40930	32316
25.00	9176	-594	9195	-6	8987	39871	40871	33401
21.25	10970	-1000	11016	-6	9089	39887	40910	34138
21.25	10610	-270	10613	-8	7819	39760	40522	40759
20.00	11206	-388	11213	-8	7848	39651	40421	41121
15.00	13586	-863	13613	-8	7978	39473	40271	42332
10.00	15955	-1346	16011	-8	8107	39273	40101	43592
5.00	18311	-1837	18403	-8	8236	39054	39913	44896
0.00	20655	-2336	20786	-8	8392	39057	39948	46034

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	708	2640	2733	1209
60.00	159	-47	166	0	803	2652	2771	1669
55.00	318	-98	333	0	903	2665	2814	2154
50.00	479	-155	503	0	1008	2678	2862	2664
48.00	543	-180	572	0	1051	2684	2883	2875
48.00	543	-180	572	0	1051	2684	2882	2876
45.00	640	-219	676	0	1118	2696	2919	3359
45.00	868	902	1251	-1806	9491	24796	26551	13537
40.00	2356	328	2379	-1806	9647	24783	26594	14406
35.00	3844	-256	3852	-1806	9793	24770	26636	15319
32.00	4736	-610	4775	-1806	9869	24782	26675	15862
32.00	4746	184	4750	-1791	8068	25603	26844	21944
30.00	5361	-10	5361	-1791	8119	25611	26867	22313
30.00	5361	-14	5361	-1791	8345	25572	26899	22839
25.00	6896	-520	6915	-1791	8495	25522	26899	23855
21.25	8044	-905	8095	-1791	8598	25534	26943	24592
21.25	8170	-271	8174	-1708	7701	25638	26770	29391
20.00	8554	-388	8563	-1708	7744	25576	26723	29696
15.00	10089	-858	10126	-1708	7897	25477	26673	30811
10.00	11618	-1338	11695	-1708	8048	25367	26613	31968
5.00	13140	-1828	13266	-1708	8198	25248	26545	33166
0.00	14655	-2324	14838	-1708	8354	25250	26596	34305

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy
 Dist. From

Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1110	-293	1148	228	-6631	19262	20372	1300
37.50	-532	-97	541	228	-6454	19254	20307	1282
35.00	45	94	104	228	-6266	19248	20242	1282
33.00	507	243	562	228	-6125	19240	20191	1283
33.00	507	243	562	228	-1574	5486	5707	3721
30.00	704	296	764	228	-1350	5473	5637	3729
27.50	868	333	930	228	-1164	5461	5584	3738
25.00	1032	366	1095	228	-977	5448	5535	3748
22.50	1195	392	1258	228	-789	5434	5491	3759
20.00	1358	413	1420	228	-602	5428	5462	3759
20.00	1358	413	1420	228	4001	-8339	9249	6058
17.50	1108	291	1145	228	4189	-8344	9337	6058
15.00	857	162	872	228	4383	-8360	9439	6040
12.50	606	28	607	228	4577	-8372	9541	6026
10.00	355	-112	372	228	4773	-8383	9646	6013
7.00	53	-288	293	228	4998	-8389	9765	6013
7.00	53	-288	293	228	9639	-22145	24152	8232
5.00	-479	-521	708	228	9789	-22150	24216	8232
2.50	-1143	-818	1406	228	9979	-22123	24269	8315
0.00	-1807	-1120	2126	228	10167	-22128	24352	8315

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1801	-181	1810	-231	-6325	22073	22961	1744
37.50	-1139	6	1139	-231	-6138	22068	22906	1745
35.00	-477	188	513	-231	-5939	22071	22856	1703
33.00	53	328	332	-231	-5778	22071	22815	1686
33.00	53	328	332	-231	-1140	8376	8453	4275
30.00	354	365	509	-231	-908	8368	8418	4281
27.50	605	389	720	-231	-713	8360	8390	4291
25.00	856	408	948	-231	-518	8349	8365	4303
22.50	1107	420	1184	-231	-323	8337	8343	4319
20.00	1357	427	1422	-231	-136	8331	8333	4319
20.00	1357	427	1422	-231	4469	-5406	7014	6808
17.50	1194	290	1229	-231	4657	-5411	7139	6808
15.00	1032	147	1042	-231	4845	-5433	7280	6794
12.50	868	-1	868	-231	5029	-5466	7427	6775
10.00	704	-155	721	-231	5216	-5471	7560	6775
7.00	506	-346	614	-231	5436	-5490	7726	6769
7.00	506	-346	614	-231	9990	-19257	21694	9140
5.00	44	-588	590	-231	10140	-19262	21768	9139
2.50	-534	-895	1042	-231	10286	-19270	21843	9182
0.00	-1112	-1206	1641	-231	10474	-19276	21938	9182

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	352	91	363	399	-2353	-660	2444	-2192
37.50	332	158	368	399	-2165	-666	2265	-2191
35.00	312	221	382	399	-1978	-671	2089	-2191
33.00	296	266	398	399	-1828	-676	1949	-2190
33.00	305	266	405	270	-29	-722	723	-2067
30.00	279	263	384	270	196	-728	754	-2067
27.50	257	255	362	270	383	-732	826	-2067
25.00	235	240	336	270	570	-735	931	-2068
22.50	213	221	307	270	757	-739	1058	-2068
20.00	191	195	273	270	945	-742	1201	-2069
20.00	200	195	280	140	2744	-782	2853	-1950
17.50	176	110	208	140	2932	-785	3035	-1951
15.00	153	19	154	140	3119	-788	3217	-1952
12.50	129	-77	150	140	3307	-793	3401	-1952
10.00	105	-179	208	140	3495	-796	3585	-1952
7.00	77	-309	318	140	3721	-799	3806	-1951
7.00	86	-308	320	11	5522	-837	5585	-1829
5.00	66	-443	448	11	5672	-840	5734	-1829
2.50	41	-616	617	11	5861	-844	5922	-1825
0.00	15	-794	795	11	6051	-848	6110	-1819

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy
 Dist. From

Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	18	107	109	-12	-2295	717	2404	-3320
37.50	40	173	178	-12	-2107	713	2225	-3320
35.00	61	234	242	-12	-1921	710	2048	-3319
33.00	78	278	289	-12	-1772	707	1908	-3318
33.00	88	277	291	-142	26	670	671	-3194
30.00	112	272	294	-142	251	666	712	-3193
27.50	132	262	293	-142	438	663	794	-3193
25.00	152	246	289	-142	624	659	908	-3193
22.50	171	224	282	-142	811	656	1043	-3193
20.00	191	197	275	-142	997	653	1192	-3194
20.00	200	197	281	-271	2796	612	2862	-3074
17.50	219	110	245	-271	2984	608	3045	-3075
15.00	237	17	238	-271	3171	603	3228	-3075
12.50	255	-81	267	-271	3360	597	3413	-3074
10.00	273	-184	329	-271	3549	592	3598	-3073
7.00	294	-316	432	-271	3774	586	3820	-3073
7.00	303	-317	438	-401	5576	538	5602	-2950
5.00	316	-452	552	-401	5728	531	5753	-2946
2.50	332	-627	709	-401	5920	522	5942	-2939
0.00	347	-807	879	-401	6107	517	6129	-2939

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	126	92	156	180	-1748	-43	1749	-1252
37.50	125	142	189	180	-1561	-47	1562	-1251
35.00	123	186	223	180	-1374	-51	1375	-1250
33.00	122	217	249	180	-1224	-54	1225	-1250
33.00	124	215	248	162	-56	-77	95	-1137
30.00	121	213	245	162	168	-81	187	-1137
27.50	119	205	237	162	356	-84	365	-1137
25.00	116	192	224	162	543	-87	550	-1137
22.50	113	173	206	162	730	-90	736	-1138
20.00	111	148	185	162	918	-93	922	-1138
20.00	112	146	184	143	2086	-113	2089	-1027
17.50	109	81	135	143	2273	-116	2276	-1028
15.00	105	10	106	143	2461	-118	2464	-1028
12.50	102	-67	122	143	2649	-121	2651	-1028
10.00	98	-149	178	143	2837	-123	2839	-1028
7.00	94	-255	272	143	3062	-126	3065	-1027
7.00	95	-257	274	125	4231	-143	4233	-915
5.00	92	-360	372	125	4381	-146	4383	-915
2.50	87	-495	502	125	4569	-148	4571	-912
0.00	83	-635	640	125	4757	-149	4760	-908

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	84	102	133	-126	-1717	124	1722	-2864
37.50	88	151	175	-126	-1530	122	1535	-2864
35.00	92	194	215	-126	-1343	120	1348	-2863
33.00	94	225	244	-126	-1194	118	1200	-2862
33.00	96	223	243	-145	-27	101	104	-2749
30.00	100	220	241	-145	198	97	221	-2749
27.50	103	211	235	-145	385	95	396	-2749
25.00	105	197	223	-145	572	92	579	-2749
22.50	108	177	207	-145	758	90	764	-2749
20.00	111	151	187	-145	945	87	949	-2750
20.00	113	149	187	-163	2113	66	2114	-2639
17.50	115	83	141	-163	2301	63	2301	-2639
15.00	116	11	117	-163	2488	60	2489	-2640
12.50	118	-66	135	-163	2676	55	2676	-2639
10.00	120	-149	191	-163	2864	51	2865	-2639
7.00	121	-256	284	-163	3089	47	3090	-2639
7.00	123	-258	286	-181	4259	24	4259	-2526
5.00	124	-362	383	-181	4409	21	4409	-2526
2.50	124	-497	513	-181	4598	16	4598	-2523
0.00	124	-638	650	-181	4787	11	4787	-2519

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.6	14.3	14.4	0.2	0.02	0.07	0.00	0.32	0.55	65.00	99.90
60.00	1.4	12.7	12.7	0.1	1.59	0.09	0.00	0.30	1.68	65.00	38.60
55.00	1.2	11.1	11.1	0.1	2.88	0.11	0.00	0.29	3.00	65.00	21.70
50.00	1.0	9.5	9.6	0.1	3.94	0.13	0.00	0.28	4.07	65.00	15.96
48.00	1.0	8.9	8.9	0.1	4.31	0.14	0.00	0.28	4.45	65.00	14.62
48.00	1.0	8.9	8.9	0.1	2.91	0.09	0.00	0.19	3.01	65.00	21.62
45.00	0.9	8.0	8.0	0.1	3.25	0.10	0.00	0.18	3.36	65.00	19.36
45.00	0.9	8.0	8.0	0.1	4.56	0.30	4.24	5.80	10.51	65.00	6.19
40.00	0.7	6.5	6.5	0.1	10.44	0.32	3.87	5.37	13.07	65.00	4.97
35.00	0.6	5.1	5.1	0.0	15.33	0.33	3.55	4.98	17.08	65.00	3.81
32.00	0.5	4.3	4.3	0.0	17.86	0.34	3.38	4.77	19.32	65.00	3.36
32.00	0.5	4.3	4.3	0.0	17.80	0.40	3.34	4.78	19.21	65.00	3.38
30.00	0.4	3.8	3.8	0.0	19.48	0.40	3.23	4.65	20.76	65.00	3.13
30.00	0.4	3.8	3.8	0.0	19.48	0.42	3.23	4.65	20.77	65.00	3.13
25.00	0.3	2.7	2.7	0.0	23.20	0.43	2.99	4.34	24.26	65.00	2.68
21.25	0.2	2.0	2.0	0.0	25.59	0.44	2.82	4.14	26.54	65.00	2.45
21.25	0.2	2.0	2.0	0.0	25.90	0.48	2.69	4.05	26.80	65.00	2.43
20.00	0.2	1.7	1.8	0.0	26.66	0.48	2.64	3.98	27.54	65.00	2.36
15.00	0.1	1.0	1.0	0.0	29.40	0.49	2.45	3.74	30.19	65.00	2.15
10.00	0.1	0.4	0.4	0.0	31.68	0.50	2.28	3.53	32.43	65.00	2.00
5.00	0.0	0.1	0.1	0.0	33.59	0.51	2.13	3.33	34.30	65.00	1.89
0.00	0.0	0.0	0.0	0.0	35.18	0.52	1.99	3.16	35.86	65.00	1.81

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.4	19.1	19.2	0.3	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	1.2	17.0	17.1	0.3	1.60	0.09	0.00	0.30	1.69	65.00	38.47
55.00	1.1	15.0	15.0	0.2	2.90	0.11	0.00	0.29	3.01	65.00	21.60
50.00	1.0	12.9	12.9	0.2	3.96	0.13	0.00	0.28	4.09	65.00	15.88
48.00	0.9	12.1	12.1	0.2	4.34	0.14	0.00	0.28	4.47	65.00	14.53
48.00	0.9	12.1	12.1	0.2	2.93	0.09	0.00	0.19	3.02	65.00	21.49
45.00	0.8	10.9	10.9	0.2	3.27	0.10	0.00	0.18	3.38	65.00	19.24
45.00	0.8	10.9	10.9	0.2	3.44	0.64	0.00	2.67	6.16	65.00	10.55
40.00	0.7	8.9	8.9	0.1	11.47	0.64	0.00	2.55	12.28	65.00	5.29
35.00	0.6	7.0	7.0	0.1	20.45	0.64	0.00	2.44	21.08	65.00	3.08
32.00	0.5	5.9	5.9	0.1	25.27	0.64	0.00	2.39	25.91	65.00	2.51
32.00	0.5	5.9	5.9	0.1	21.71	0.87	0.01	2.32	22.66	65.00	2.87
30.00	0.4	5.2	5.3	0.1	24.36	0.87	0.01	2.28	25.23	65.00	2.58
30.00	0.4	5.2	5.3	0.1	24.36	0.89	0.01	2.28	25.25	65.00	2.57
25.00	0.3	3.7	3.7	0.0	30.90	0.88	0.01	2.19	31.78	65.00	2.05
21.25	0.3	2.7	2.7	0.0	35.10	0.87	0.01	2.13	35.97	65.00	1.81
21.25	0.3	2.7	2.7	0.0	33.36	1.04	0.01	2.11	34.40	65.00	1.89
20.00	0.2	2.4	2.4	0.0	34.66	1.04	0.01	2.08	35.70	65.00	1.82
15.00	0.1	1.4	1.4	0.0	39.31	1.03	0.01	2.00	40.34	65.00	1.61
10.00	0.1	0.6	0.6	0.0	43.20	1.03	0.01	1.92	44.23	65.00	1.47
5.00	0.0	0.2	0.2	0.0	46.47	1.02	0.01	1.85	47.49	65.00	1.37
0.00	0.0	0.0	0.0	0.0	49.19	1.01	0.01	1.79	50.20	65.00	1.29

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	14.3	14.4	0.2	0.02	0.07	0.00	0.32	0.55	65.00	99.90
60.00	1.2	12.7	12.7	0.1	1.59	0.09	0.00	0.30	1.68	65.00	38.58
55.00	1.0	11.1	11.1	0.1	2.89	0.11	0.00	0.29	3.00	65.00	21.68
50.00	0.9	9.5	9.6	0.1	3.94	0.13	0.00	0.28	4.08	65.00	15.95
48.00	0.9	8.9	9.0	0.1	4.31	0.14	0.00	0.28	4.45	65.00	14.60
48.00	0.9	8.9	9.0	0.1	2.92	0.09	0.00	0.19	3.01	65.00	21.59
45.00	0.8	8.0	8.0	0.1	3.26	0.10	0.00	0.18	3.36	65.00	19.33
45.00	0.8	8.0	8.0	0.1	6.04	0.42	4.25	5.92	11.92	65.00	5.45
40.00	0.7	6.5	6.5	0.1	10.40	0.43	3.88	5.48	13.69	65.00	4.75
35.00	0.6	5.1	5.1	0.1	15.26	0.44	3.56	5.09	17.03	65.00	3.82
32.00	0.5	4.3	4.3	0.0	18.16	0.44	3.39	4.88	19.60	65.00	3.32
32.00	0.5	4.3	4.3	0.0	17.78	0.61	3.36	4.87	19.76	65.00	3.29
30.00	0.4	3.8	3.8	0.0	19.24	0.61	3.25	4.74	21.03	65.00	3.09
30.00	0.4	3.8	3.8	0.0	19.24	0.63	3.25	4.74	21.05	65.00	3.09
25.00	0.3	2.7	2.7	0.0	23.29	0.63	3.00	4.43	24.50	65.00	2.65
21.25	0.3	2.0	2.0	0.0	25.88	0.63	2.83	4.22	26.99	65.00	2.41
21.25	0.3	2.0	2.0	0.0	25.74	0.75	2.70	4.08	26.91	65.00	2.42
20.00	0.2	1.7	1.8	0.0	26.53	0.75	2.65	4.02	27.68	65.00	2.35
15.00	0.1	1.0	1.0	0.0	29.35	0.75	2.46	3.78	30.42	65.00	2.14
10.00	0.1	0.4	0.4	0.0	31.71	0.75	2.29	3.56	32.72	65.00	1.99
5.00	0.0	0.1	0.1	0.0	33.68	0.76	2.14	3.36	34.65	65.00	1.88
0.00	0.0	0.0	0.0	0.0	35.31	0.76	2.00	3.18	36.25	65.00	1.79

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.8	10.9	10.9	0.2	18.10	0.09	1.74	4.58	18.49	65.00	3.52
37.50	0.8	10.9	10.9	0.2	8.42	0.09	1.74	4.57	9.49	65.00	6.85
35.00	0.8	10.9	11.0	0.3	1.66	0.09	1.74	4.55	7.96	65.00	8.16
33.00	0.8	11.0	11.0	0.3	8.93	0.09	1.74	4.55	9.49	65.00	6.85
33.00	0.8	11.0	11.0	0.3	8.93	0.25	1.74	2.54	9.62	65.00	6.76
30.00	0.8	11.0	11.0	0.4	12.15	0.25	1.74	2.53	12.72	65.00	5.11
27.50	0.8	11.0	11.0	0.5	14.79	0.25	1.74	2.52	15.30	65.00	4.25
25.00	0.8	10.9	11.0	0.5	17.40	0.25	1.74	2.52	17.86	65.00	3.64
22.50	0.8	10.8	10.8	0.5	19.96	0.26	1.74	2.51	20.39	65.00	3.19
20.00	0.8	10.6	10.7	0.5	22.48	0.26	1.74	2.50	22.89	65.00	2.84
20.00	0.8	10.6	10.7	0.5	22.48	0.41	1.74	3.03	23.08	65.00	2.82
17.50	0.8	10.4	10.4	0.4	18.05	0.41	1.74	3.04	18.69	65.00	3.48
15.00	0.8	10.1	10.2	0.4	13.59	0.41	1.74	3.05	14.28	65.00	4.55
12.50	0.8	9.8	9.8	0.3	9.08	0.41	1.74	3.07	9.88	65.00	6.58
10.00	0.8	9.4	9.5	0.2	5.90	0.41	1.75	3.09	7.33	65.00	8.87
7.00	0.8	9.0	9.0	0.1	4.56	0.41	1.75	3.11	6.77	65.00	9.60
7.00	0.8	9.0	9.0	0.1	4.56	0.56	1.75	5.11	9.71	65.00	6.69
5.00	0.8	8.7	8.7	0.1	10.58	0.56	1.75	5.12	12.25	65.00	5.30
2.50	0.8	8.3	8.3	0.1	21.78	0.57	1.75	5.12	22.57	65.00	2.88
0.00	0.8	8.0	8.0	0.1	33.38	0.57	1.75	5.13	34.10	65.00	1.91

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.9	8.0	8.0	0.1	27.58	0.12	1.77	4.96	27.80	65.00	2.34
37.50	0.9	8.3	8.3	0.2	16.78	0.12	1.77	4.96	18.10	65.00	3.59
35.00	0.9	8.6	8.7	0.3	8.15	0.12	1.77	4.95	10.54	65.00	6.17
33.00	0.9	9.0	9.0	0.3	5.14	0.11	1.77	4.95	9.81	65.00	6.63
33.00	0.9	9.0	9.0	0.3	5.14	0.29	1.77	2.95	7.27	65.00	8.94
30.00	0.9	9.4	9.5	0.4	7.52	0.29	1.77	2.94	9.20	65.00	7.07
27.50	0.9	9.8	9.8	0.5	11.27	0.29	1.77	2.94	12.13	65.00	5.36
25.00	0.8	10.1	10.1	0.5	15.07	0.29	1.77	2.94	15.80	65.00	4.11
22.50	0.8	10.4	10.4	0.5	18.83	0.29	1.77	2.94	19.49	65.00	3.34
20.00	0.8	10.6	10.7	0.5	22.54	0.29	1.77	2.93	23.15	65.00	2.81
20.00	0.8	10.6	10.7	0.5	22.54	0.46	1.77	2.75	23.28	65.00	2.79
17.50	0.8	10.8	10.8	0.4	19.32	0.46	1.77	2.77	20.11	65.00	3.23
15.00	0.8	10.9	11.0	0.4	16.06	0.46	1.77	2.79	16.92	65.00	3.84
12.50	0.8	11.0	11.0	0.3	12.77	0.46	1.77	2.81	14.03	65.00	4.63
10.00	0.8	11.0	11.0	0.2	11.29	0.46	1.77	2.83	12.67	65.00	5.13
7.00	0.8	11.0	11.0	0.2	9.55	0.46	1.77	2.85	11.10	65.00	5.86
7.00	0.8	11.0	11.0	0.2	9.55	0.62	1.77	4.78	12.46	65.00	5.21
5.00	0.8	10.9	11.0	0.1	8.91	0.62	1.77	4.79	12.64	65.00	5.14
2.50	0.8	10.9	10.9	0.1	16.40	0.62	1.77	4.80	18.19	65.00	3.57
0.00	0.8	10.9	10.9	0.2	24.50	0.62	1.77	4.82	25.92	65.00	2.51

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	5.9	5.9	0.1	5.72	0.15	3.06	3.40	8.11	65.00	8.02
37.50	0.5	5.9	5.9	0.1	5.84	0.15	3.06	3.37	8.16	65.00	7.97
35.00	0.5	5.9	5.9	0.2	5.93	0.15	3.06	3.35	8.19	65.00	7.94
33.00	0.5	5.8	5.9	0.2	5.97	0.15	3.06	3.33	8.19	65.00	7.93
33.00	0.5	5.8	5.9	0.2	6.11	0.14	2.07	2.17	7.16	65.00	9.07
30.00	0.5	5.8	5.8	0.2	5.70	0.14	2.07	2.17	6.84	65.00	9.50
27.50	0.5	5.7	5.7	0.2	5.33	0.14	2.07	2.18	6.55	65.00	9.93
25.00	0.5	5.6	5.6	0.2	4.96	0.14	2.07	2.20	6.23	65.00	10.43
22.50	0.5	5.5	5.5	0.2	4.54	0.14	2.07	2.21	5.90	65.00	11.01
20.00	0.5	5.4	5.4	0.2	4.03	0.14	2.07	2.23	5.56	65.00	11.69
20.00	0.5	5.4	5.4	0.2	4.13	0.13	1.07	1.47	4.89	65.00	13.29
17.50	0.5	5.3	5.3	0.2	3.26	0.13	1.07	1.50	4.18	65.00	15.54
15.00	0.5	5.2	5.2	0.1	2.36	0.13	1.07	1.52	3.54	65.00	18.38
12.50	0.5	5.0	5.1	0.1	2.37	0.13	1.07	1.55	3.66	65.00	17.78
10.00	0.5	4.9	4.9	0.0	3.27	0.13	1.07	1.57	4.14	65.00	15.69
7.00	0.5	4.7	4.8	0.0	5.01	0.13	1.07	1.60	5.66	65.00	11.48
7.00	0.5	4.7	4.8	0.0	5.06	0.12	0.08	0.86	5.25	65.00	12.38
5.00	0.5	4.6	4.6	0.0	6.91	0.12	0.08	0.88	7.09	65.00	9.17
2.50	0.5	4.5	4.5	0.0	9.30	0.12	0.08	0.91	9.46	65.00	6.87
0.00	0.5	4.3	4.3	0.0	11.77	0.12	0.08	0.93	11.93	65.00	5.45

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	4.3	4.3	0.0	1.69	0.23	0.09	0.43	1.92	65.00	33.77
37.50	0.5	4.5	4.5	0.1	2.79	0.23	0.09	0.40	3.02	65.00	21.52
35.00	0.5	4.6	4.6	0.2	3.81	0.23	0.09	0.38	4.04	65.00	16.10
33.00	0.5	4.7	4.8	0.2	4.56	0.23	0.09	0.36	4.79	65.00	13.57
33.00	0.5	4.7	4.8	0.2	4.61	0.22	1.09	1.18	5.13	65.00	12.68
30.00	0.5	4.9	4.9	0.2	4.68	0.22	1.09	1.19	5.19	65.00	12.53
27.50	0.5	5.0	5.1	0.2	4.65	0.22	1.09	1.20	5.15	65.00	12.61
25.00	0.5	5.2	5.2	0.2	4.54	0.22	1.09	1.21	5.04	65.00	12.89
22.50	0.5	5.3	5.3	0.2	4.34	0.22	1.09	1.23	4.85	65.00	13.40
20.00	0.5	5.4	5.4	0.2	4.06	0.22	1.09	1.25	4.58	65.00	14.18
20.00	0.5	5.4	5.4	0.2	4.14	0.21	2.08	2.48	5.81	65.00	11.18
17.50	0.5	5.5	5.5	0.2	3.88	0.21	2.08	2.50	5.67	65.00	11.46
15.00	0.5	5.6	5.6	0.1	3.59	0.21	2.08	2.53	5.52	65.00	11.78
12.50	0.5	5.7	5.7	0.1	4.24	0.21	2.08	2.56	5.89	65.00	11.04
10.00	0.5	5.8	5.8	0.1	5.13	0.21	2.08	2.58	6.56	65.00	9.91
7.00	0.5	5.8	5.9	0.0	6.44	0.21	2.08	2.61	7.46	65.00	8.71
7.00	0.5	5.8	5.9	0.0	6.50	0.20	3.07	3.85	8.98	65.00	7.24
5.00	0.5	5.9	5.9	0.0	8.57	0.20	3.07	3.87	10.15	65.00	6.41
2.50	0.5	5.9	5.9	0.0	11.24	0.20	3.07	3.90	12.45	65.00	5.22
0.00	0.5	5.9	5.9	0.1	13.98	0.20	3.07	3.93	15.00	65.00	4.33

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.7	2.7	0.0	2.42	0.09	1.38	1.62	3.63	65.00	17.92
37.50	0.3	2.7	2.7	0.1	2.84	0.09	1.38	1.59	3.79	65.00	17.17
35.00	0.3	2.7	2.7	0.1	3.48	0.09	1.38	1.57	4.23	65.00	15.37
33.00	0.3	2.7	2.7	0.1	3.93	0.09	1.38	1.55	4.61	65.00	14.11
33.00	0.3	2.7	2.7	0.1	3.92	0.08	1.24	1.25	4.52	65.00	14.38
30.00	0.3	2.7	2.7	0.2	3.87	0.08	1.24	1.26	4.49	65.00	14.48
27.50	0.3	2.6	2.6	0.2	3.74	0.08	1.24	1.29	4.38	65.00	14.83
25.00	0.3	2.6	2.6	0.2	3.52	0.08	1.24	1.31	4.21	65.00	15.45
22.50	0.3	2.6	2.6	0.2	3.23	0.08	1.24	1.34	3.97	65.00	16.39
20.00	0.3	2.5	2.5	0.1	2.85	0.08	1.24	1.37	3.66	65.00	17.74
20.00	0.3	2.5	2.5	0.1	2.83	0.07	1.10	1.39	3.57	65.00	18.23
17.50	0.3	2.5	2.5	0.1	2.09	0.07	1.10	1.42	3.23	65.00	20.13
15.00	0.3	2.4	2.4	0.1	1.61	0.07	1.10	1.44	2.98	65.00	21.82
12.50	0.3	2.3	2.4	0.0	1.90	0.07	1.10	1.47	3.19	65.00	20.39
10.00	0.3	2.3	2.3	0.0	2.79	0.07	1.10	1.50	3.60	65.00	18.04
7.00	0.3	2.2	2.2	0.0	4.32	0.07	1.10	1.53	4.92	65.00	13.21
7.00	0.3	2.2	2.2	0.0	4.36	0.06	0.96	1.55	4.89	65.00	13.30
5.00	0.3	2.1	2.1	0.0	5.86	0.06	0.96	1.57	6.28	65.00	10.35
2.50	0.3	2.0	2.1	0.0	7.80	0.06	0.96	1.60	8.15	65.00	7.98
0.00	0.3	2.0	2.0	0.0	9.83	0.06	0.96	1.62	10.12	65.00	6.42

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.0	2.0	0.0	2.02	0.19	0.97	1.21	2.90	65.00	22.40
37.50	0.2	2.0	2.1	0.1	2.76	0.19	0.97	1.18	3.45	65.00	18.83
35.00	0.2	2.1	2.1	0.1	3.41	0.19	0.97	1.16	4.02	65.00	16.17
33.00	0.2	2.2	2.2	0.1	3.88	0.19	0.97	1.14	4.44	65.00	14.65
33.00	0.2	2.2	2.2	0.1	3.86	0.19	1.11	1.12	4.47	65.00	14.54
30.00	0.3	2.3	2.3	0.2	3.84	0.19	1.11	1.14	4.44	65.00	14.64
27.50	0.3	2.3	2.4	0.2	3.73	0.19	1.11	1.16	4.33	65.00	15.00
25.00	0.3	2.4	2.4	0.2	3.53	0.19	1.11	1.19	4.15	65.00	15.66
22.50	0.3	2.5	2.5	0.2	3.26	0.19	1.11	1.21	3.90	65.00	16.68
20.00	0.3	2.5	2.5	0.1	2.90	0.19	1.11	1.24	3.58	65.00	18.18
20.00	0.3	2.5	2.5	0.1	2.88	0.18	1.25	1.54	3.63	65.00	17.92
17.50	0.3	2.6	2.6	0.1	2.19	0.18	1.25	1.57	3.35	65.00	19.42
15.00	0.3	2.6	2.6	0.1	1.78	0.18	1.25	1.59	3.17	65.00	20.54
12.50	0.3	2.6	2.6	0.0	2.14	0.18	1.25	1.62	3.38	65.00	19.25
10.00	0.3	2.7	2.7	0.0	2.92	0.18	1.25	1.65	3.74	65.00	17.38
7.00	0.3	2.7	2.7	0.0	4.51	0.18	1.25	1.68	5.05	65.00	12.86
7.00	0.3	2.7	2.7	0.0	4.55	0.17	1.38	1.98	5.19	65.00	12.53
5.00	0.3	2.7	2.7	0.0	6.08	0.17	1.38	2.00	6.56	65.00	9.91
2.50	0.3	2.7	2.7	0.0	8.07	0.17	1.38	2.03	8.47	65.00	7.67
0.00	0.3	2.7	2.7	0.0	10.14	0.17	1.38	2.05	10.50	65.00	6.19

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	728	2657	2755	1203
60.00	164	-44	170	0	730	2764	2859	1663
55.00	334	-88	345	0	732	2876	2968	2148
50.00	510	-132	526	0	734	2994	3082	2659
48.00	582	-149	601	0	735	3043	3130	2869
48.00	582	-149	601	0	735	3042	3129	2870
45.00	693	-176	715	0	736	3121	3207	3353
45.00	931	-428	1025	1838	-744	25685	25696	9959
40.00	2477	-382	2506	1838	-782	25804	25816	10833
35.00	4029	-334	4043	1838	-809	25925	25938	11750
32.00	4964	-305	4974	1838	-808	26012	26025	12292
32.00	4984	-273	4991	1855	2142	27296	27379	14929
30.00	5640	-325	5649	1855	2143	27354	27438	15298
30.00	5643	-324	5652	1855	2121	27542	27623	15827
25.00	7300	-450	7314	1855	2095	27647	27727	16851
21.25	8546	-544	8564	1855	2097	27761	27840	17588
21.25	8677	-512	8692	1804	4568	28367	28732	19634
20.00	9103	-580	9121	1804	4550	28363	28726	19948
15.00	10809	-851	10843	1804	4523	28443	28801	21080
10.00	12521	-1120	12571	1804	4496	28517	28869	22255
5.00	14237	-1388	14304	1804	4469	28584	28932	23471
0.00	15957	-1656	16042	1804	4470	28742	29088	24609

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	702	2674	2765	1181
60.00	165	-42	171	0	703	2785	2872	1640
55.00	336	-84	347	0	704	2901	2985	2126
50.00	514	-127	529	0	705	3023	3104	2636
48.00	587	-144	604	0	705	3074	3153	2847
48.00	587	-144	604	0	705	3073	3153	2847
45.00	699	-169	719	0	706	3156	3234	3330
45.00	225	596	637	-4	8101	42417	43184	20338
40.00	2774	110	2776	-4	8104	42525	43291	21245
35.00	5330	-376	5343	-4	8103	42627	43390	22211
32.00	6866	-668	6899	-4	8104	42718	43480	22753
32.00	6050	75	6050	-8	7209	42468	43075	31261
30.00	7070	-98	7070	-8	7209	42529	43136	31630
30.00	7073	-98	7073	-8	7208	42668	43273	32212
25.00	9638	-531	9652	-8	7204	42706	43309	33313
21.25	11562	-855	11594	-8	7205	42824	43426	34050
21.25	11182	-269	11185	-10	5991	43728	44136	40662
20.00	11838	-359	11844	-9	5987	43647	44056	41042
15.00	14462	-718	14480	-9	5978	43598	44006	42284
10.00	17082	-1077	17116	-9	5965	43529	43936	43578
5.00	19699	-1435	19751	-9	5948	43444	43850	44920
0.00	22310	-1791	22382	-9	5948	43603	44007	46058

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	678	2670	2755	1204
60.00	165	-41	170	0	677	2777	2858	1664
55.00	335	-81	345	0	677	2889	2967	2149
50.00	512	-122	526	0	676	3007	3082	2659
48.00	585	-138	601	0	676	3056	3130	2870
48.00	585	-138	601	0	676	3055	3129	2871
45.00	696	-162	715	0	676	3134	3206	3354
45.00	933	877	1280	-1846	9222	25743	27345	13171
40.00	2482	323	2502	-1846	9264	25844	27454	14044
35.00	4036	-234	4043	-1846	9292	25951	27564	14961
32.00	4972	-569	5004	-1846	9292	26038	27646	15504
32.00	4991	145	4993	-1866	7263	27316	28265	21251
30.00	5648	-29	5648	-1866	7263	27375	28322	21621
30.00	5651	-30	5651	-1866	7283	27542	28488	22149
25.00	7308	-468	7323	-1866	7306	27622	28572	23175
21.25	8553	-797	8590	-1866	7307	27735	28682	23911
21.25	8683	-237	8687	-1815	6057	28326	28966	28416
20.00	9109	-329	9115	-1815	6070	28297	28941	28731
15.00	10811	-695	10833	-1815	6086	28336	28982	29862
10.00	12516	-1063	12561	-1815	6097	28368	29016	31037
5.00	14222	-1431	14294	-1815	6104	28394	29043	32252
0.00	15931	-1797	16032	-1815	6104	28552	29198	33391

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1115	-363	1172	236	-6893	19627	20802	1485
37.50	-527	-159	550	236	-6707	19568	20685	1485
35.00	59	39	71	236	-6542	19503	20571	1467
33.00	527	195	562	236	-6393	19456	20480	1467
33.00	527	195	562	236	-1870	5692	5991	3904
30.00	731	258	775	236	-1649	5615	5852	3912
27.50	898	305	948	236	-1464	5550	5740	3922
25.00	1064	346	1119	236	-1279	5483	5631	3933
22.50	1227	382	1285	236	-1093	5416	5525	3945
20.00	1389	412	1449	236	-907	5358	5434	3945
20.00	1389	412	1449	236	3669	-8419	9184	6240
17.50	1135	299	1174	236	3855	-8478	9313	6240
15.00	880	181	898	236	4049	-8546	9456	6221
12.50	622	56	625	236	4241	-8611	9599	6207
10.00	363	-74	370	236	4437	-8674	9743	6192
7.00	49	-237	242	236	4660	-8744	9908	6192
7.00	49	-237	242	236	9277	-22509	24346	8404
5.00	-491	-462	674	236	9426	-22555	24446	8404
2.50	-1168	-748	1387	236	9618	-22579	24543	8487
0.00	-1847	-1039	2119	236	9804	-22637	24669	8487

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1839	-252	1856	-238	-6584	22574	23514	1430
37.50	-1162	-57	1164	-238	-6398	22516	23408	1430
35.00	-487	132	505	-238	-6200	22465	23305	1386
33.00	51	279	284	-238	-6040	22423	23222	1368
33.00	51	279	284	-238	-1427	8720	8836	3962
30.00	364	326	489	-238	-1197	8649	8731	3969
27.50	623	359	719	-238	-1004	8587	8645	3979
25.00	880	386	961	-238	-810	8523	8562	3992
22.50	1134	408	1205	-238	-617	8458	8480	4009
20.00	1387	423	1450	-238	-431	8399	8411	4009
20.00	1387	423	1450	-238	4147	-5346	6766	6503
17.50	1226	296	1261	-238	4333	-5404	6927	6503
15.00	1063	163	1075	-238	4519	-5478	7102	6489
12.50	897	25	897	-238	4704	-5551	7276	6478
10.00	729	-119	739	-238	4887	-5622	7449	6469
7.00	525	-299	604	-238	5105	-5704	7655	6462
7.00	525	-299	604	-238	9632	-19480	21731	8831
5.00	57	-532	535	-238	9781	-19527	21839	8831
2.50	-530	-828	983	-238	9926	-19588	21960	8871
0.00	-1118	-1128	1589	-238	10112	-19647	22097	8871

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	325	13	326	408	-2664	-117	2667	-2054
37.50	321	91	334	408	-2479	-176	2485	-2054
35.00	315	162	354	408	-2293	-235	2305	-2053
33.00	309	216	376	408	-2144	-281	2162	-2053
33.00	309	216	377	278	-347	-381	515	-2051
30.00	294	224	370	278	-123	-450	467	-2051
27.50	279	225	359	278	62	-506	510	-2051
25.00	263	221	344	278	248	-563	615	-2051
22.50	246	210	323	278	434	-619	756	-2052
20.00	226	195	298	278	620	-675	917	-2052
20.00	226	195	299	149	2418	-768	2537	-2055
17.50	202	120	235	149	2604	-823	2731	-2056
15.00	177	39	181	149	2791	-879	2926	-2056
12.50	149	-48	157	149	2977	-936	3120	-2057
10.00	121	-140	185	149	3164	-991	3315	-2057
7.00	84	-258	271	149	3388	-1057	3550	-2056
7.00	84	-257	270	19	5188	-1147	5313	-2056
5.00	56	-383	387	19	5337	-1193	5469	-2056
2.50	19	-546	547	19	5525	-1249	5664	-2053
0.00	-19	-715	715	19	5713	-1305	5860	-2048

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-17	31	35	-20	-2604	1300	2910	-2967
37.50	21	106	109	-20	-2417	1243	2718	-2966
35.00	58	176	185	-20	-2232	1186	2527	-2966
33.00	86	228	244	-20	-2083	1141	2375	-2965
33.00	86	227	243	-149	-286	1051	1089	-2962
30.00	122	234	264	-149	-62	983	985	-2962
27.50	151	233	277	-149	123	927	935	-2961
25.00	178	226	288	-149	309	870	924	-2961
22.50	203	214	295	-149	494	814	953	-2961
20.00	227	196	300	-149	680	758	1018	-2961
20.00	227	196	300	-279	2478	664	2565	-2962
17.50	246	119	273	-279	2664	607	2732	-2962
15.00	263	36	266	-279	2850	549	2902	-2963
12.50	279	-52	284	-279	3037	491	3076	-2963
10.00	293	-146	327	-279	3224	433	3253	-2962
7.00	307	-266	406	-279	3448	364	3467	-2962
7.00	307	-267	407	-408	5247	262	5254	-2961
5.00	313	-394	503	-408	5398	213	5402	-2957
2.50	318	-559	643	-408	5587	151	5589	-2952
0.00	322	-730	797	-408	5773	93	5774	-2952

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	90	20	92	190	-2029	485	2087	-1268
37.50	103	79	130	190	-1843	428	1892	-1267
35.00	115	131	175	190	-1657	371	1698	-1267
33.00	124	169	210	190	-1508	326	1543	-1267
33.00	124	169	210	170	-342	245	421	-1265
30.00	131	177	221	170	-118	178	214	-1265
27.50	136	178	224	170	68	122	140	-1265
25.00	139	173	222	170	254	66	263	-1265
22.50	140	163	215	170	440	11	440	-1265
20.00	139	147	202	170	627	-45	629	-1265
20.00	139	147	202	150	1794	-123	1798	-1267
17.50	135	90	162	150	1980	-178	1988	-1267
15.00	129	28	132	150	2167	-232	2179	-1267
12.50	121	-40	127	150	2354	-288	2371	-1268
10.00	111	-113	159	150	2541	-342	2564	-1267
7.00	98	-209	230	150	2765	-409	2795	-1267
7.00	98	-208	230	131	3933	-483	3962	-1267
5.00	86	-305	316	131	4082	-528	4116	-1267
2.50	69	-430	435	131	4269	-582	4309	-1265
0.00	51	-561	563	131	4457	-636	4503	-1262

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	52	31	60	-130	-2000	635	2098	-2487
37.50	70	88	112	-130	-1813	580	1904	-2486
35.00	87	139	164	-130	-1626	525	1709	-2486
33.00	99	177	202	-130	-1477	481	1554	-2485
33.00	99	177	202	-150	-311	406	511	-2484
30.00	112	184	215	-150	-87	339	350	-2483
27.50	122	184	220	-150	99	284	300	-2483
25.00	129	178	220	-150	285	228	365	-2483
22.50	135	166	215	-150	471	173	502	-2483
20.00	140	150	205	-150	657	117	668	-2484
20.00	140	149	205	-170	1824	39	1824	-2484
17.50	140	92	168	-170	2010	-17	2010	-2485
15.00	139	29	142	-170	2197	-73	2198	-2485
12.50	136	-40	141	-170	2383	-130	2387	-2485
10.00	131	-114	174	-170	2570	-186	2577	-2485
7.00	123	-211	244	-170	2794	-254	2805	-2485
7.00	123	-211	244	-190	3962	-335	3976	-2484
5.00	114	-308	328	-190	4112	-381	4129	-2483
2.50	102	-434	446	-190	4300	-439	4322	-2479
0.00	88	-566	572	-190	4486	-496	4514	-2479

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	15.3	15.4	0.2	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	1.2	13.6	13.6	0.2	1.64	0.09	0.00	0.31	1.73	65.00	37.62
55.00	1.0	11.9	11.9	0.1	2.99	0.11	0.00	0.31	3.10	65.00	20.96
50.00	0.9	10.2	10.3	0.1	4.13	0.13	0.00	0.30	4.26	65.00	15.25
48.00	0.8	9.6	9.6	0.1	4.54	0.14	0.00	0.30	4.68	65.00	13.90
48.00	0.8	9.6	9.6	0.1	3.07	0.09	0.00	0.20	3.16	65.00	20.56
45.00	0.7	8.6	8.6	0.1	3.45	0.10	0.00	0.20	3.55	65.00	18.28
45.00	0.7	8.6	8.6	0.1	4.88	0.31	4.33	5.95	10.82	65.00	6.01
40.00	0.6	7.0	7.0	0.1	10.97	0.32	3.95	5.51	13.63	65.00	4.77
35.00	0.5	5.5	5.5	0.1	16.06	0.34	3.62	5.12	17.84	65.00	3.64
32.00	0.4	4.6	4.7	0.0	18.71	0.34	3.45	4.91	20.19	65.00	3.22
32.00	0.4	4.6	4.7	0.0	18.75	0.42	3.48	5.02	20.24	65.00	3.21
30.00	0.4	4.1	4.1	0.0	20.54	0.42	3.37	4.88	21.89	65.00	2.97
30.00	0.4	4.1	4.1	0.0	20.55	0.43	3.37	4.89	21.91	65.00	2.97
25.00	0.3	2.9	2.9	0.0	24.56	0.44	3.11	4.58	25.68	65.00	2.53
21.25	0.2	2.1	2.1	0.0	27.15	0.45	2.93	4.37	28.15	65.00	2.31
21.25	0.2	2.1	2.1	0.0	27.53	0.50	2.85	4.33	28.51	65.00	2.28
20.00	0.2	1.9	1.9	0.0	28.37	0.51	2.80	4.26	29.32	65.00	2.22
15.00	0.1	1.1	1.1	0.0	31.40	0.52	2.60	4.01	32.27	65.00	2.01
10.00	0.0	0.5	0.5	0.0	33.95	0.52	2.42	3.79	34.76	65.00	1.87
5.00	0.0	0.1	0.1	0.0	36.10	0.53	2.26	3.58	36.87	65.00	1.76
0.00	0.0	0.0	0.0	0.0	37.91	0.54	2.11	3.40	38.65	65.00	1.68

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	20.4	20.4	0.3	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	1.0	18.1	18.2	0.3	1.64	0.09	0.00	0.31	1.73	65.00	37.51
55.00	0.9	15.9	15.9	0.3	3.00	0.11	0.00	0.31	3.11	65.00	20.88
50.00	0.8	13.7	13.7	0.2	4.15	0.13	0.00	0.31	4.28	65.00	15.18
48.00	0.7	12.9	12.9	0.2	4.56	0.14	0.00	0.31	4.70	65.00	13.83
48.00	0.7	12.9	12.9	0.2	3.09	0.09	0.00	0.20	3.18	65.00	20.46
45.00	0.7	11.6	11.6	0.2	3.47	0.10	0.00	0.20	3.57	65.00	18.19
45.00	0.7	11.6	11.6	0.2	3.06	0.64	0.01	2.73	6.00	65.00	10.83
40.00	0.6	9.5	9.5	0.1	11.93	0.63	0.01	2.61	12.72	65.00	5.11
35.00	0.5	7.4	7.5	0.1	21.18	0.63	0.01	2.51	21.81	65.00	2.98
32.00	0.4	6.3	6.3	0.1	26.12	0.63	0.01	2.45	26.75	65.00	2.43
32.00	0.4	6.3	6.3	0.1	22.50	0.87	0.01	2.43	23.44	65.00	2.77
30.00	0.4	5.6	5.6	0.1	25.45	0.87	0.01	2.40	26.32	65.00	2.47
30.00	0.4	5.6	5.6	0.1	25.46	0.88	0.01	2.40	26.35	65.00	2.47
25.00	0.3	4.0	4.0	0.0	32.37	0.88	0.01	2.31	33.25	65.00	1.95
21.25	0.2	2.9	2.9	0.0	36.82	0.87	0.01	2.25	37.70	65.00	1.72
21.25	0.2	2.9	2.9	0.0	35.15	1.04	0.02	2.28	36.19	65.00	1.80
20.00	0.2	2.6	2.6	0.0	36.57	1.04	0.01	2.26	37.61	65.00	1.73
15.00	0.1	1.5	1.5	0.0	41.69	1.03	0.01	2.17	42.72	65.00	1.52
10.00	0.1	0.7	0.7	0.0	46.00	1.03	0.01	2.09	47.03	65.00	1.38
5.00	0.0	0.2	0.2	0.0	49.63	1.02	0.01	2.02	50.65	65.00	1.28
0.00	0.0	0.0	0.0	0.0	52.68	1.02	0.01	1.96	53.69	65.00	1.21

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	15.3	15.4	0.2	0.02	0.07	0.00	0.32	0.56	65.00	99.90
60.00	0.9	13.6	13.6	0.2	1.64	0.09	0.00	0.31	1.73	65.00	37.63
55.00	0.8	11.9	11.9	0.1	2.99	0.11	0.00	0.31	3.10	65.00	20.97
50.00	0.7	10.2	10.2	0.1	4.13	0.13	0.00	0.30	4.26	65.00	15.26
48.00	0.7	9.6	9.6	0.1	4.54	0.14	0.00	0.30	4.67	65.00	13.91
48.00	0.7	9.6	9.6	0.1	3.07	0.09	0.00	0.20	3.16	65.00	20.57
45.00	0.7	8.6	8.6	0.1	3.45	0.10	0.00	0.20	3.55	65.00	18.29
45.00	0.7	8.6	8.6	0.1	6.18	0.41	4.34	6.07	12.17	65.00	5.34
40.00	0.6	7.0	7.0	0.1	10.93	0.42	3.97	5.62	14.18	65.00	4.58
35.00	0.5	5.5	5.5	0.1	15.98	0.43	3.64	5.23	17.76	65.00	3.66
32.00	0.4	4.6	4.7	0.0	19.00	0.43	3.46	5.01	20.40	65.00	3.19
32.00	0.4	4.6	4.7	0.0	18.65	0.59	3.50	5.09	20.62	65.00	3.15
30.00	0.4	4.1	4.1	0.0	20.28	0.59	3.38	4.95	22.04	65.00	2.95
30.00	0.4	4.1	4.1	0.0	20.29	0.61	3.38	4.96	22.06	65.00	2.95
25.00	0.3	2.9	2.9	0.0	24.60	0.61	3.12	4.65	25.79	65.00	2.52
21.25	0.2	2.1	2.1	0.0	27.38	0.61	2.95	4.43	28.45	65.00	2.28
21.25	0.2	2.1	2.1	0.0	27.32	0.73	2.87	4.37	28.46	65.00	2.28
20.00	0.2	1.9	1.9	0.0	28.18	0.73	2.81	4.30	29.30	65.00	2.22
15.00	0.1	1.1	1.1	0.0	31.28	0.73	2.61	4.04	32.32	65.00	2.01
10.00	0.1	0.5	0.5	0.0	33.90	0.73	2.43	3.82	34.87	65.00	1.86
5.00	0.0	0.1	0.1	0.0	36.09	0.73	2.27	3.61	37.02	65.00	1.76
0.00	0.0	0.0	0.0	0.0	37.93	0.74	2.13	3.43	38.83	65.00	1.67

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	11.6	11.6	0.2	18.60	0.10	1.81	4.70	19.01	65.00	3.42
37.50	0.7	11.6	11.6	0.2	8.71	0.10	1.81	4.69	9.46	65.00	6.87
35.00	0.7	11.6	11.7	0.3	1.11	0.10	1.81	4.67	8.09	65.00	8.04
33.00	0.7	11.7	11.7	0.4	8.93	0.10	1.81	4.65	9.50	65.00	6.84
33.00	0.7	11.7	11.7	0.4	8.93	0.27	1.81	2.64	9.68	65.00	6.71
30.00	0.7	11.7	11.7	0.4	12.31	0.27	1.81	2.62	12.93	65.00	5.03
27.50	0.7	11.7	11.7	0.5	15.06	0.27	1.81	2.61	15.61	65.00	4.17
25.00	0.7	11.6	11.6	0.5	17.74	0.27	1.81	2.60	18.24	65.00	3.56
22.50	0.7	11.5	11.5	0.5	20.36	0.27	1.81	2.58	20.83	65.00	3.12
20.00	0.7	11.3	11.4	0.5	22.92	0.27	1.81	2.57	23.36	65.00	2.78
20.00	0.7	11.3	11.4	0.5	22.92	0.42	1.81	3.09	23.55	65.00	2.76
17.50	0.7	11.1	11.1	0.4	18.51	0.42	1.81	3.11	19.18	65.00	3.39
15.00	0.7	10.8	10.8	0.4	14.03	0.42	1.81	3.13	14.77	65.00	4.40
12.50	0.7	10.4	10.5	0.3	9.49	0.42	1.81	3.14	10.35	65.00	6.28
10.00	0.7	10.1	10.1	0.2	5.78	0.42	1.81	3.16	7.28	65.00	8.93
7.00	0.7	9.6	9.6	0.2	3.79	0.42	1.81	3.19	6.46	65.00	10.06
7.00	0.7	9.6	9.6	0.2	3.79	0.57	1.81	5.20	9.57	65.00	6.80
5.00	0.7	9.3	9.3	0.1	10.03	0.57	1.81	5.21	11.75	65.00	5.53
2.50	0.7	8.9	8.9	0.1	21.73	0.58	1.81	5.23	22.53	65.00	2.88
0.00	0.7	8.6	8.6	0.1	33.47	0.58	1.81	5.25	34.20	65.00	1.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	8.6	8.6	0.1	28.56	0.10	1.82	5.09	28.77	65.00	2.26
37.50	0.7	8.9	8.9	0.2	17.43	0.10	1.82	5.08	18.11	65.00	3.59
35.00	0.7	9.3	9.3	0.3	7.97	0.09	1.82	5.07	10.43	65.00	6.23
33.00	0.7	9.6	9.6	0.3	4.41	0.09	1.82	5.06	9.64	65.00	6.74
33.00	0.7	9.6	9.6	0.3	4.41	0.27	1.82	3.06	6.86	65.00	9.47
30.00	0.7	10.1	10.1	0.4	7.34	0.27	1.83	3.04	8.82	65.00	7.37
27.50	0.7	10.4	10.5	0.5	11.34	0.27	1.83	3.03	12.20	65.00	5.33
25.00	0.7	10.8	10.8	0.5	15.28	0.27	1.82	3.02	16.00	65.00	4.06
22.50	0.7	11.1	11.1	0.5	19.16	0.27	1.82	3.01	19.80	65.00	3.28
20.00	0.7	11.3	11.4	0.5	22.97	0.27	1.82	3.00	23.56	65.00	2.76
20.00	0.7	11.3	11.4	0.5	22.97	0.44	1.82	2.77	23.69	65.00	2.74
17.50	0.7	11.5	11.5	0.5	19.83	0.44	1.82	2.79	20.59	65.00	3.16
15.00	0.7	11.6	11.7	0.4	16.61	0.44	1.82	2.81	17.44	65.00	3.73
12.50	0.7	11.7	11.7	0.3	13.34	0.44	1.82	2.84	14.29	65.00	4.55
10.00	0.7	11.7	11.7	0.3	11.45	0.44	1.82	2.86	12.81	65.00	5.08
7.00	0.7	11.7	11.7	0.2	9.54	0.44	1.82	2.89	11.09	65.00	5.86
7.00	0.7	11.7	11.7	0.2	9.54	0.60	1.82	4.84	12.38	65.00	5.25
5.00	0.7	11.6	11.7	0.2	8.17	0.60	1.82	4.86	12.15	65.00	5.35
2.50	0.7	11.6	11.6	0.1	15.40	0.60	1.82	4.87	17.31	65.00	3.76
0.00	0.7	11.6	11.6	0.2	23.40	0.60	1.82	4.89	24.89	65.00	2.61

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	6.3	6.3	0.1	4.87	0.14	3.13	3.50	7.65	65.00	8.49
37.50	0.4	6.3	6.3	0.1	5.27	0.14	3.13	3.47	7.88	65.00	8.25
35.00	0.4	6.3	6.3	0.2	5.62	0.14	3.13	3.45	8.09	65.00	8.04
33.00	0.4	6.3	6.3	0.2	5.85	0.14	3.13	3.43	8.22	65.00	7.90
33.00	0.4	6.3	6.3	0.2	5.85	0.14	2.13	2.21	6.98	65.00	9.31
30.00	0.4	6.2	6.2	0.2	5.68	0.14	2.13	2.20	6.86	65.00	9.47
27.50	0.4	6.1	6.1	0.2	5.48	0.14	2.13	2.20	6.71	65.00	9.69
25.00	0.4	6.0	6.0	0.2	5.21	0.14	2.13	2.22	6.51	65.00	9.99
22.50	0.4	5.9	5.9	0.2	4.89	0.14	2.13	2.24	6.27	65.00	10.37
20.00	0.4	5.8	5.8	0.2	4.51	0.14	2.13	2.26	5.99	65.00	10.86
20.00	0.4	5.8	5.8	0.2	4.51	0.14	1.14	1.49	5.25	65.00	12.37
17.50	0.4	5.7	5.7	0.2	3.70	0.14	1.14	1.52	4.57	65.00	14.22
15.00	0.4	5.6	5.6	0.1	2.83	0.14	1.14	1.55	3.90	65.00	16.69
12.50	0.4	5.4	5.4	0.1	2.49	0.14	1.14	1.57	3.78	65.00	17.18
10.00	0.4	5.3	5.3	0.1	2.79	0.14	1.14	1.60	3.92	65.00	16.57
7.00	0.4	5.1	5.1	0.0	4.30	0.14	1.14	1.63	5.10	65.00	12.73
7.00	0.4	5.1	5.1	0.0	4.29	0.14	0.15	0.89	4.54	65.00	14.33
5.00	0.4	5.0	5.0	0.0	5.97	0.14	0.15	0.91	6.20	65.00	10.49
2.50	0.4	4.8	4.8	0.0	8.14	0.14	0.15	0.94	8.35	65.00	7.79
0.00	0.4	4.6	4.7	0.0	10.62	0.14	0.15	0.96	10.76	65.00	6.04

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	4.6	4.7	0.0	0.56	0.20	0.15	0.55	0.99	65.00	65.35
37.50	0.4	4.8	4.8	0.1	1.69	0.20	0.15	0.53	1.91	65.00	34.08
35.00	0.4	5.0	5.0	0.1	2.94	0.20	0.15	0.50	3.15	65.00	20.64
33.00	0.4	5.1	5.1	0.2	3.87	0.20	0.15	0.48	4.08	65.00	15.94
33.00	0.4	5.1	5.1	0.2	3.86	0.20	1.14	1.29	4.43	65.00	14.66
30.00	0.4	5.3	5.3	0.2	4.18	0.20	1.14	1.28	4.72	65.00	13.76
27.50	0.4	5.4	5.4	0.2	4.34	0.20	1.14	1.27	4.87	65.00	13.34
25.00	0.4	5.6	5.6	0.2	4.41	0.20	1.14	1.27	4.93	65.00	13.18
22.50	0.4	5.7	5.7	0.2	4.39	0.20	1.14	1.28	4.91	65.00	13.24
20.00	0.4	5.8	5.8	0.2	4.53	0.20	1.14	1.29	5.05	65.00	12.87
20.00	0.4	5.8	5.8	0.2	4.53	0.20	2.14	2.49	6.11	65.00	10.64
17.50	0.4	5.9	5.9	0.2	4.34	0.20	2.14	2.52	6.00	65.00	10.83
15.00	0.4	6.0	6.0	0.2	4.09	0.20	2.14	2.54	5.86	65.00	11.09
12.50	0.4	6.1	6.1	0.1	4.42	0.20	2.14	2.57	6.04	65.00	10.75
10.00	0.4	6.2	6.2	0.1	5.19	0.20	2.14	2.59	6.64	65.00	9.79
7.00	0.4	6.3	6.3	0.1	6.13	0.20	2.14	2.62	7.41	65.00	8.77
7.00	0.4	6.3	6.3	0.1	6.13	0.20	3.13	3.86	8.85	65.00	7.35
5.00	0.4	6.3	6.3	0.0	7.70	0.20	3.13	3.88	9.53	65.00	6.82
2.50	0.4	6.3	6.3	0.0	10.16	0.20	3.13	3.91	11.57	65.00	5.62
0.00	0.4	6.3	6.3	0.1	12.68	0.20	3.13	3.94	13.82	65.00	4.70

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.9	2.9	0.0	1.44	0.09	1.46	1.75	3.26	65.00	19.96
37.50	0.2	2.9	2.9	0.1	2.00	0.09	1.46	1.72	3.47	65.00	18.74
35.00	0.2	2.9	2.9	0.1	2.63	0.09	1.46	1.69	3.74	65.00	17.39
33.00	0.2	2.9	2.9	0.1	3.24	0.09	1.46	1.67	4.13	65.00	15.72
33.00	0.2	2.9	2.9	0.1	3.24	0.09	1.30	1.36	4.03	65.00	16.12
30.00	0.2	2.9	2.9	0.1	3.41	0.09	1.30	1.33	4.18	65.00	15.57
27.50	0.2	2.8	2.8	0.2	3.45	0.09	1.30	1.32	4.21	65.00	15.44
25.00	0.2	2.8	2.8	0.2	3.39	0.09	1.30	1.34	4.17	65.00	15.59
22.50	0.2	2.8	2.8	0.2	3.25	0.09	1.30	1.37	4.05	65.00	16.05
20.00	0.2	2.7	2.7	0.1	3.01	0.09	1.30	1.39	3.86	65.00	16.82
20.00	0.2	2.7	2.7	0.1	3.01	0.09	1.15	1.40	3.85	65.00	16.87
17.50	0.2	2.7	2.7	0.1	2.53	0.09	1.15	1.43	3.56	65.00	18.24
15.00	0.2	2.6	2.6	0.1	2.06	0.09	1.15	1.45	3.26	65.00	19.92
12.50	0.2	2.5	2.5	0.1	2.02	0.09	1.15	1.48	3.30	65.00	19.68
10.00	0.2	2.5	2.5	0.0	2.34	0.09	1.15	1.51	3.54	65.00	18.36
7.00	0.2	2.4	2.4	0.0	3.66	0.09	1.15	1.54	4.42	65.00	14.71
7.00	0.2	2.4	2.4	0.0	3.66	0.09	1.00	1.55	4.35	65.00	14.96
5.00	0.2	2.3	2.3	0.0	5.00	0.09	1.00	1.57	5.55	65.00	11.71
2.50	0.2	2.2	2.2	0.0	6.74	0.09	1.00	1.60	7.19	65.00	9.04
0.00	0.2	2.1	2.1	0.0	8.55	0.09	1.00	1.63	8.94	65.00	7.27

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC1 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.1	2.1	0.0	0.95	0.17	1.00	1.29	2.41	65.00	27.02
37.50	0.2	2.2	2.2	0.1	1.72	0.17	1.00	1.26	2.71	65.00	23.98
35.00	0.2	2.3	2.3	0.1	2.58	0.17	1.00	1.24	3.26	65.00	19.91
33.00	0.2	2.4	2.4	0.1	3.20	0.17	1.00	1.22	3.80	65.00	17.11
33.00	0.2	2.4	2.4	0.1	3.20	0.17	1.15	1.22	3.88	65.00	16.74
30.00	0.2	2.5	2.5	0.1	3.38	0.17	1.15	1.20	4.04	65.00	16.08
27.50	0.2	2.5	2.5	0.2	3.44	0.17	1.15	1.19	4.09	65.00	15.90
25.00	0.2	2.6	2.6	0.2	3.40	0.17	1.15	1.20	4.05	65.00	16.04
22.50	0.2	2.7	2.7	0.2	3.27	0.17	1.15	1.22	3.94	65.00	16.52
20.00	0.2	2.7	2.7	0.1	3.05	0.17	1.15	1.24	3.74	65.00	17.38
20.00	0.2	2.7	2.7	0.1	3.05	0.17	1.30	1.56	3.86	65.00	16.82
17.50	0.2	2.8	2.8	0.1	2.62	0.17	1.30	1.58	3.65	65.00	17.81
15.00	0.2	2.8	2.8	0.1	2.21	0.17	1.30	1.61	3.42	65.00	19.00
12.50	0.2	2.8	2.9	0.1	2.24	0.17	1.30	1.64	3.48	65.00	18.67
10.00	0.2	2.9	2.9	0.0	2.62	0.17	1.30	1.66	3.76	65.00	17.30
7.00	0.2	2.9	2.9	0.0	3.85	0.17	1.30	1.69	4.49	65.00	14.48
7.00	0.2	2.9	2.9	0.0	3.85	0.17	1.46	2.01	4.72	65.00	13.76
5.00	0.2	2.9	2.9	0.0	5.22	0.17	1.46	2.03	5.87	65.00	11.08
2.50	0.2	2.9	2.9	0.0	7.00	0.17	1.46	2.06	7.47	65.00	8.71
0.00	0.2	2.9	2.9	0.0	8.85	0.17	1.46	2.08	9.24	65.00	7.04

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	739	2402	2514	343
60.00	144	-49	152	0	834	2409	2549	802
55.00	289	-102	307	0	934	2415	2590	1287
50.00	434	-161	463	0	1040	2422	2635	1798
48.00	492	-187	527	0	1083	2424	2655	2008
48.00	492	-187	527	0	1083	2424	2655	2009
45.00	580	-227	623	0	1151	2430	2689	2492
45.00	688	185	712	856	2637	12980	13245	650
40.00	1467	24	1467	856	2754	12991	13280	1486
35.00	2247	-144	2251	856	2860	13001	13312	2384
32.00	2715	-248	2726	856	2935	13007	13334	2926
32.00	2616	-227	2626	845	1733	13310	13422	5600
30.00	2936	-270	2948	845	1784	13314	13433	5970
30.00	2936	-273	2948	845	1987	13313	13460	6461
25.00	3735	-395	3756	845	2112	13313	13479	7429
21.25	4334	-493	4362	845	2214	13319	13501	8166
21.25	4379	-462	4404	806	4686	13368	14165	10195
20.00	4580	-532	4611	806	4716	13359	14167	10461
15.00	5382	-819	5444	806	4850	13346	14200	11513
10.00	6183	-1114	6282	806	4988	13329	14232	12603
5.00	6983	-1417	7125	806	5130	13307	14261	13732
0.00	7781	-1730	7971	806	5286	13308	14319	14870

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	729	2407	2515	334
60.00	145	-48	153	0	824	2415	2552	793
55.00	290	-101	307	0	924	2424	2594	1278
50.00	436	-159	464	0	1029	2433	2642	1788
48.00	494	-185	527	0	1073	2437	2662	1999
48.00	494	-185	527	0	1073	2436	2662	2000
45.00	582	-224	624	0	1140	2445	2698	2483
45.00	368	520	637	0	7027	20926	22075	1804
40.00	1624	95	1627	0	7143	20938	22123	2660
35.00	2881	-337	2900	0	7264	20949	22172	3559
32.00	3635	-600	3684	0	7339	20957	22205	4101
32.00	3055	118	3058	-2	6758	20444	21532	12599
30.00	3546	-44	3546	-2	6809	20450	21554	12968
30.00	3546	-48	3547	-1	7016	20440	21610	13472
25.00	4773	-472	4796	-2	7145	20427	21640	14459
21.25	5692	-796	5748	-2	7247	20435	21682	15195
21.25	5494	-211	5498	-2	6278	20400	21344	21762
20.00	5800	-305	5808	-2	6310	20371	21326	22043
15.00	7023	-688	7057	-2	6446	20324	21322	23118
10.00	8243	-1079	8313	-2	6585	20270	21313	24235
5.00	9459	-1479	9574	-2	6726	20208	21298	25392
0.00	10671	-1887	10837	-2	6882	20209	21349	26531

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-2	2	0	719	2409	2514	343
60.00	145	-48	152	0	814	2416	2549	802
55.00	290	-100	307	0	914	2423	2590	1287
50.00	436	-158	463	0	1020	2430	2635	1798
48.00	494	-183	527	0	1063	2433	2656	2008
48.00	494	-183	527	0	1063	2433	2655	2009
45.00	582	-222	623	0	1130	2440	2689	2492
45.00	688	132	700	-856	3955	12996	13585	3795
40.00	1468	-109	1472	-856	4080	13001	13626	4643
35.00	2248	-358	2276	-856	4207	13005	13669	5529
32.00	2716	-510	2764	-856	4283	13012	13698	6072
32.00	2617	190	2624	-847	6820	13435	15067	11739
30.00	2939	26	2939	-847	6872	13439	15094	12109
30.00	2939	23	2939	-847	7083	13429	15183	12600
25.00	3745	-407	3767	-847	7219	13417	15236	13569
21.25	4349	-734	4411	-847	7321	13424	15290	14306
21.25	4393	-174	4397	-807	6502	13487	14973	18769
20.00	4596	-272	4604	-807	6538	13466	14970	19036
15.00	5404	-669	5445	-807	6680	13434	15003	20087
10.00	6210	-1075	6302	-807	6824	13397	15034	21178
5.00	7014	-1489	7170	-807	6970	13354	15064	22308
0.00	7815	-1912	8045	-807	7126	13356	15138	23447

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-541	411	680	106	1914	9241	9437	-2239
37.50	-264	351	439	106	2098	9237	9472	-2244
35.00	13	285	286	106	2286	9234	9513	-2244
33.00	235	229	328	106	2433	9232	9547	-2245
33.00	235	229	328	106	1218	2654	2920	-539
30.00	330	181	377	106	1443	2650	3017	-539
27.50	410	135	431	106	1630	2647	3109	-538
25.00	489	83	496	106	1817	2645	3209	-537
22.50	568	26	569	106	2003	2644	3317	-533
20.00	648	-37	649	106	2191	2641	3431	-533
20.00	648	-37	649	106	988	-3946	4068	1147
17.50	529	-69	534	106	1176	-3950	4122	1143
15.00	411	-107	425	106	1365	-3954	4183	1141
12.50	292	-151	329	106	1553	-3957	4251	1139
10.00	173	-201	265	106	1740	-3960	4326	1139
7.00	31	-267	269	106	1966	-3964	4425	1138
7.00	31	-267	269	106	770	-10557	10585	2799
5.00	-223	-288	364	106	920	-10559	10599	2799
2.50	-539	-318	626	106	1110	-10558	10616	2813
0.00	-856	-354	927	106	1297	-10561	10640	2814

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-856	412	950	-108	1848	10548	10709	-1499
37.50	-539	354	645	-108	2037	10544	10739	-1509
35.00	-223	290	366	-108	2225	10541	10774	-1509
33.00	30	235	237	-108	2376	10539	10803	-1514
33.00	30	235	237	-108	1181	3965	4138	225
30.00	173	188	256	-108	1407	3962	4205	225
27.50	291	143	325	-108	1596	3959	4269	228
25.00	410	93	420	-108	1785	3956	4340	230
22.50	529	36	530	-108	1974	3952	4418	233
20.00	647	-26	648	-108	2161	3950	4502	233
20.00	647	-26	648	-108	958	-2628	2798	1956
17.50	568	-57	571	-108	1146	-2631	2870	1955
15.00	489	-95	498	-108	1333	-2636	2954	1953
12.50	410	-137	433	-108	1520	-2641	3047	1951
10.00	331	-186	379	-108	1706	-2646	3148	1949
7.00	235	-251	344	-108	1930	-2651	3279	1948
7.00	235	-251	344	-108	714	-9234	9262	3642
5.00	14	-270	271	-108	864	-9237	9277	3642
2.50	-263	-299	398	-108	1044	-9239	9298	3648
0.00	-541	-333	635	-108	1232	-9242	9324	3648

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	163	0	163	289	-2743	-319	2762	2158
37.50	153	80	173	289	-2555	-324	2576	2158
35.00	143	154	210	289	-2368	-327	2390	2159
33.00	135	209	249	289	-2217	-331	2242	2159
33.00	145	209	254	159	-416	-355	547	2283
30.00	132	220	256	159	-190	-359	406	2283
27.50	121	223	258	159	-2	-362	362	2283
25.00	110	220	246	159	187	-364	409	2283
22.50	99	211	234	159	375	-367	524	2283
20.00	88	197	216	159	563	-369	673	2283
20.00	97	198	220	30	2364	-389	2396	2402
17.50	86	124	151	30	2552	-392	2581	2402
15.00	74	44	86	30	2740	-394	2768	2401
12.50	62	-41	74	30	2928	-396	2954	2401
10.00	50	-131	141	30	3115	-398	3140	2402
7.00	36	-247	250	30	3340	-401	3364	2401
7.00	45	-247	251	-100	5139	-421	5156	2523
5.00	35	-372	374	-100	5287	-424	5304	2526
2.50	22	-534	534	-100	5473	-427	5489	2531
0.00	9	-701	701	-100	5660	-430	5676	2531

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	11	21	23	98	-2665	304	2683	1198
37.50	20	98	100	98	-2478	302	2496	1199
35.00	29	169	172	98	-2290	299	2309	1200
33.00	36	223	226	98	-2140	298	2161	1200
33.00	46	222	227	-31	-340	278	439	1324
30.00	56	230	237	-31	-114	276	299	1324
27.50	64	231	240	-31	74	274	284	1324
25.00	72	226	237	-31	262	272	378	1324
22.50	80	215	230	-31	450	270	525	1324
20.00	88	199	218	-31	638	268	692	1324
20.00	98	199	221	-161	2438	247	2451	1443
17.50	105	123	161	-161	2627	244	2638	1442
15.00	112	41	120	-161	2814	242	2825	1442
12.50	119	-46	128	-161	3002	237	3011	1442
10.00	127	-139	188	-161	3189	233	3198	1443
7.00	135	-258	291	-161	3415	231	3422	1443
7.00	144	-258	296	-290	5214	205	5218	1565
5.00	149	-385	413	-290	5363	199	5367	1568
2.50	155	-549	570	-290	5550	193	5553	1573
0.00	161	-718	736	-290	5737	190	5740	1574

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	59	19	62	98	-2055	-21	2056	-1164
37.50	59	78	98	98	-1868	-24	1868	-1164
35.00	58	131	144	98	-1681	-26	1681	-1163
33.00	57	170	179	98	-1531	-27	1531	-1163
33.00	59	168	178	80	-363	-39	365	-1050
30.00	57	177	186	80	-138	-41	144	-1050
27.50	56	179	187	80	50	-43	66	-1050
25.00	55	174	183	80	237	-45	241	-1050
22.50	53	164	173	80	424	-46	427	-1050
20.00	52	149	158	80	612	-48	614	-1050
20.00	54	147	157	62	1780	-58	1781	-939
17.50	52	91	105	62	1967	-60	1968	-939
15.00	50	29	58	62	2155	-61	2156	-940
12.50	48	-38	62	62	2343	-63	2344	-940
10.00	46	-112	121	62	2530	-64	2531	-940
7.00	44	-207	211	62	2756	-65	2757	-940
7.00	46	-208	213	44	3925	-75	3925	-827
5.00	44	-304	308	44	4075	-76	4075	-827
2.50	42	-429	431	44	4263	-77	4263	-825
0.00	39	-560	562	44	4451	-78	4452	-822

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	40	31	50	-45	-2018	56	2019	-2476
37.50	41	88	98	-45	-1830	54	1831	-2476
35.00	43	141	147	-45	-1643	53	1644	-2476
33.00	44	178	184	-45	-1493	52	1494	-2475
33.00	46	176	182	-63	-326	43	329	-2362
30.00	47	184	190	-63	-102	41	110	-2362
27.50	49	184	191	-63	85	40	94	-2362
25.00	50	179	186	-63	272	39	275	-2362
22.50	51	168	176	-63	459	37	461	-2362
20.00	52	151	160	-63	647	36	648	-2362
20.00	54	150	159	-81	1815	25	1815	-2251
17.50	55	92	107	-81	2002	23	2002	-2251
15.00	55	29	63	-81	2190	22	2190	-2252
12.50	56	-39	68	-81	2377	19	2377	-2252
10.00	56	-113	126	-81	2565	18	2565	-2252
7.00	57	-210	217	-81	2791	15	2791	-2252
7.00	59	-211	219	-99	3960	3	3960	-2139
5.00	59	-308	314	-99	4110	2	4110	-2139
2.50	59	-434	438	-99	4299	-1	4299	-2137
0.00	59	-566	569	-99	4488	-4	4488	-2134

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	7.8	7.9	0.1	0.02	0.02	0.00	0.29	0.50	65.00	99.90
60.00	1.0	6.9	7.0	0.0	1.46	0.04	0.00	0.28	1.51	65.00	43.10
55.00	0.9	6.0	6.1	0.0	2.65	0.07	0.00	0.27	2.72	65.00	23.93
50.00	0.8	5.1	5.2	0.0	3.62	0.09	0.00	0.26	3.71	65.00	17.53
48.00	0.7	4.8	4.9	0.0	3.96	0.10	0.00	0.26	4.05	65.00	16.04
48.00	0.7	4.8	4.9	0.0	2.68	0.06	0.00	0.17	2.74	65.00	23.71
45.00	0.7	4.3	4.3	0.0	2.99	0.08	0.00	0.17	3.06	65.00	21.21
45.00	0.7	4.3	4.3	0.0	3.44	0.02	2.01	2.85	5.55	65.00	11.71
40.00	0.6	3.5	3.5	0.0	6.27	0.04	1.84	2.64	7.30	65.00	8.90
35.00	0.5	2.7	2.8	0.0	8.91	0.07	1.69	2.46	9.46	65.00	6.87
32.00	0.4	2.3	2.3	0.0	10.31	0.08	1.60	2.36	10.77	65.00	6.03
32.00	0.4	2.3	2.3	0.0	9.92	0.16	1.58	2.33	10.49	65.00	6.19
30.00	0.4	2.0	2.1	0.0	10.79	0.16	1.53	2.27	11.31	65.00	5.75
30.00	0.4	2.0	2.1	0.0	10.79	0.18	1.53	2.27	11.32	65.00	5.74
25.00	0.3	1.4	1.5	0.0	12.71	0.20	1.42	2.13	13.16	65.00	4.94
21.25	0.2	1.0	1.1	0.0	13.95	0.21	1.34	2.03	14.36	65.00	4.53
21.25	0.2	1.0	1.1	0.0	14.06	0.26	1.27	2.00	14.48	65.00	4.49
20.00	0.2	0.9	0.9	0.0	14.47	0.27	1.25	1.97	14.88	65.00	4.37
15.00	0.1	0.5	0.5	0.0	15.93	0.28	1.16	1.86	16.33	65.00	3.98
10.00	0.0	0.2	0.2	0.0	17.16	0.30	1.08	1.76	17.55	65.00	3.70
5.00	0.0	0.1	0.1	0.0	18.19	0.31	1.01	1.66	18.58	65.00	3.50
0.00	0.0	0.0	0.0	0.0	19.06	0.33	0.94	1.58	19.44	65.00	3.34

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	10.1	10.2	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	1.0	9.0	9.0	0.1	1.47	0.04	0.00	0.28	1.51	65.00	43.07
55.00	0.9	7.8	7.9	0.1	2.65	0.07	0.00	0.27	2.72	65.00	23.90
50.00	0.8	6.7	6.8	0.1	3.63	0.09	0.00	0.26	3.71	65.00	17.50
48.00	0.7	6.3	6.3	0.1	3.96	0.10	0.00	0.26	4.06	65.00	16.01
48.00	0.7	6.3	6.3	0.1	2.68	0.06	0.00	0.17	2.75	65.00	23.67
45.00	0.7	5.6	5.7	0.0	2.99	0.08	0.00	0.17	3.07	65.00	21.17
45.00	0.7	5.6	5.7	0.0	3.03	0.06	0.00	1.39	3.83	65.00	16.97
40.00	0.6	4.6	4.6	0.0	7.02	0.08	0.00	1.33	7.21	65.00	9.01
35.00	0.5	3.6	3.6	0.0	11.59	0.10	0.00	1.28	11.69	65.00	5.56
32.00	0.4	3.1	3.1	0.0	14.07	0.11	0.00	1.25	14.19	65.00	4.58
32.00	0.4	3.1	3.1	0.0	11.44	0.35	0.00	1.21	11.85	65.00	5.48
30.00	0.4	2.7	2.7	0.0	12.76	0.36	0.00	1.20	13.12	65.00	4.96
30.00	0.4	2.7	2.7	0.0	12.76	0.37	0.00	1.20	13.13	65.00	4.95
25.00	0.3	1.9	1.9	0.0	16.22	0.38	0.00	1.15	16.60	65.00	3.92
21.25	0.2	1.4	1.4	0.0	18.44	0.39	0.00	1.12	18.83	65.00	3.45
21.25	0.2	1.4	1.4	0.0	17.34	0.56	0.00	1.11	17.89	65.00	3.63
20.00	0.2	1.2	1.3	0.0	18.02	0.56	0.00	1.10	18.58	65.00	3.50
15.00	0.1	0.7	0.7	0.0	20.50	0.57	0.00	1.06	21.07	65.00	3.09
10.00	0.1	0.3	0.3	0.0	22.59	0.57	0.00	1.02	23.16	65.00	2.81
5.00	0.0	0.1	0.1	0.0	24.35	0.58	0.00	0.98	24.93	65.00	2.61
0.00	0.0	0.0	0.0	0.0	25.83	0.58	0.00	0.95	26.42	65.00	2.46

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	7.9	7.9	0.1	0.02	0.02	0.00	0.29	0.50	65.00	99.90
60.00	1.0	6.9	7.0	0.0	1.47	0.04	0.00	0.28	1.51	65.00	43.08
55.00	0.9	6.0	6.1	0.0	2.65	0.07	0.00	0.27	2.72	65.00	23.91
50.00	0.8	5.2	5.2	0.0	3.62	0.09	0.00	0.26	3.71	65.00	17.52
48.00	0.7	4.8	4.9	0.0	3.96	0.10	0.00	0.26	4.06	65.00	16.02
48.00	0.7	4.8	4.9	0.0	2.68	0.06	0.00	0.17	2.74	65.00	23.70
45.00	0.7	4.3	4.4	0.0	2.99	0.08	0.00	0.17	3.07	65.00	21.20
45.00	0.7	4.3	4.4	0.0	3.37	0.12	2.01	2.87	5.62	65.00	11.57
40.00	0.6	3.5	3.5	0.0	6.37	0.14	1.84	2.66	7.40	65.00	8.78
35.00	0.5	2.7	2.8	0.0	9.14	0.16	1.69	2.48	9.77	65.00	6.65
32.00	0.4	2.3	2.3	0.0	10.58	0.17	1.60	2.38	11.12	65.00	5.85
32.00	0.4	2.3	2.3	0.0	9.89	0.33	1.59	2.44	10.88	65.00	5.98
30.00	0.4	2.0	2.1	0.0	10.57	0.33	1.54	2.37	11.49	65.00	5.66
30.00	0.4	2.0	2.1	0.0	10.56	0.35	1.54	2.38	11.50	65.00	5.65
25.00	0.3	1.4	1.5	0.0	12.76	0.36	1.42	2.23	13.41	65.00	4.85
21.25	0.2	1.0	1.1	0.0	14.20	0.37	1.34	2.13	14.80	65.00	4.39
21.25	0.2	1.0	1.1	0.0	13.87	0.48	1.28	2.05	14.56	65.00	4.47
20.00	0.2	0.9	0.9	0.0	14.30	0.48	1.25	2.02	14.98	65.00	4.34
15.00	0.1	0.5	0.5	0.0	15.88	0.49	1.16	1.90	16.53	65.00	3.93
10.00	0.1	0.2	0.2	0.0	17.21	0.50	1.08	1.80	17.83	65.00	3.64
5.00	0.0	0.1	0.1	0.0	18.32	0.51	1.01	1.70	18.93	65.00	3.43
0.00	0.0	0.0	0.0	0.0	19.25	0.52	0.95	1.62	19.86	65.00	3.27

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	5.6	5.7	0.0	10.46	0.15	0.81	2.13	10.77	65.00	6.04
37.50	0.7	5.7	5.7	0.1	6.77	0.15	0.81	2.13	7.65	65.00	8.49
35.00	0.7	5.7	5.7	0.1	4.27	0.15	0.81	2.14	5.75	65.00	11.29
33.00	0.7	5.7	5.7	0.1	4.84	0.15	0.81	2.14	6.17	65.00	10.54
33.00	0.7	5.7	5.7	0.1	4.84	0.04	0.81	1.22	5.28	65.00	12.31
30.00	0.7	5.7	5.8	0.1	5.96	0.04	0.81	1.23	6.31	65.00	10.30
27.50	0.7	5.7	5.8	0.1	6.84	0.04	0.81	1.25	7.17	65.00	9.07
25.00	0.7	5.7	5.7	0.1	7.70	0.04	0.81	1.26	8.00	65.00	8.12
22.50	0.7	5.6	5.7	0.0	8.51	0.04	0.81	1.27	8.80	65.00	7.38
20.00	0.7	5.6	5.6	0.0	9.75	0.04	0.81	1.29	9.92	65.00	6.55
20.00	0.7	5.6	5.6	0.0	9.75	0.08	0.81	1.38	9.87	65.00	6.58
17.50	0.7	5.5	5.5	0.0	8.20	0.08	0.81	1.38	8.38	65.00	7.76
15.00	0.7	5.3	5.4	0.0	6.69	0.08	0.81	1.39	6.93	65.00	9.38
12.50	0.7	5.2	5.2	0.0	5.21	0.08	0.81	1.40	5.56	65.00	11.70
10.00	0.7	5.0	5.0	-0.1	4.00	0.08	0.81	1.41	4.63	65.00	14.04
7.00	0.7	4.8	4.8	-0.1	4.12	0.08	0.81	1.43	4.74	65.00	13.73
7.00	0.7	4.8	4.8	-0.1	4.12	0.19	0.81	2.29	5.50	65.00	11.82
5.00	0.7	4.6	4.7	0.0	5.58	0.19	0.81	2.29	6.53	65.00	9.96
2.50	0.7	4.5	4.5	0.0	9.87	0.19	0.81	2.29	10.08	65.00	6.45
0.00	0.7	4.3	4.4	0.0	14.74	0.19	0.81	2.29	14.95	65.00	4.35

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	4.3	4.3	0.0	15.09	0.10	0.83	2.32	15.22	65.00	4.27
37.50	0.7	4.4	4.5	0.1	10.09	0.10	0.83	2.33	10.23	65.00	6.35
35.00	0.7	4.6	4.7	0.1	5.63	0.10	0.83	2.33	6.58	65.00	9.88
33.00	0.7	4.8	4.8	0.1	3.64	0.10	0.83	2.33	5.34	65.00	12.18
33.00	0.7	4.8	4.8	0.1	3.64	0.02	0.83	1.40	4.38	65.00	14.83
30.00	0.7	5.0	5.0	0.1	3.82	0.02	0.83	1.41	4.55	65.00	14.29
27.50	0.7	5.2	5.2	0.1	5.16	0.02	0.83	1.42	5.60	65.00	11.60
25.00	0.7	5.3	5.4	0.1	6.59	0.02	0.83	1.43	6.96	65.00	9.33
22.50	0.7	5.4	5.5	0.1	7.99	0.02	0.83	1.44	8.32	65.00	7.82
20.00	0.7	5.6	5.6	0.0	9.67	0.02	0.83	1.45	9.81	65.00	6.63
20.00	0.7	5.6	5.6	0.0	9.67	0.13	0.83	1.22	9.98	65.00	6.51
17.50	0.7	5.6	5.7	0.0	8.70	0.13	0.83	1.23	9.05	65.00	7.19
15.00	0.7	5.7	5.7	0.0	7.77	0.13	0.83	1.24	8.14	65.00	7.98
12.50	0.7	5.7	5.8	0.0	6.87	0.13	0.83	1.25	7.28	65.00	8.93
10.00	0.7	5.7	5.8	0.0	5.99	0.13	0.83	1.27	6.46	65.00	10.06
7.00	0.7	5.7	5.7	0.0	5.13	0.13	0.83	1.28	5.70	65.00	11.40
7.00	0.7	5.7	5.7	0.0	5.13	0.25	0.83	2.12	6.44	65.00	10.09
5.00	0.7	5.7	5.7	0.0	4.06	0.25	0.83	2.12	5.62	65.00	11.57
2.50	0.7	5.7	5.7	0.0	6.00	0.25	0.83	2.12	7.11	65.00	9.14
0.00	0.7	5.6	5.7	0.0	9.97	0.25	0.83	2.13	10.42	65.00	6.24

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	3.1	3.1	0.0	2.39	0.15	2.21	2.60	5.17	65.00	12.58
37.50	0.4	3.1	3.1	0.1	2.73	0.15	2.21	2.57	5.29	65.00	12.29
35.00	0.4	3.0	3.1	0.1	3.13	0.15	2.21	2.55	5.43	65.00	11.97
33.00	0.4	3.0	3.0	0.1	3.89	0.15	2.21	2.53	5.77	65.00	11.27
33.00	0.4	3.0	3.0	0.1	3.95	0.16	1.22	1.30	4.67	65.00	13.91
30.00	0.4	3.0	3.0	0.2	4.03	0.16	1.22	1.28	4.74	65.00	13.72
27.50	0.4	3.0	3.0	0.2	4.01	0.16	1.22	1.27	4.71	65.00	13.80
25.00	0.4	2.9	2.9	0.2	3.90	0.16	1.22	1.28	4.61	65.00	14.11
22.50	0.4	2.9	2.9	0.2	3.71	0.16	1.22	1.30	4.43	65.00	14.67
20.00	0.4	2.8	2.9	0.2	3.44	0.16	1.22	1.32	4.19	65.00	15.53
20.00	0.4	2.8	2.9	0.2	3.50	0.16	0.23	0.56	3.67	65.00	17.71
17.50	0.4	2.8	2.8	0.1	2.34	0.16	0.23	0.59	2.52	65.00	25.82
15.00	0.4	2.7	2.7	0.1	1.36	0.16	0.23	0.61	1.54	65.00	42.23
12.50	0.4	2.7	2.7	0.1	1.16	0.16	0.23	0.64	1.47	65.00	44.10
10.00	0.4	2.6	2.6	0.0	2.23	0.16	0.23	0.67	2.40	65.00	27.10
7.00	0.4	2.5	2.5	0.0	3.85	0.16	0.23	0.70	4.02	65.00	16.18
7.00	0.4	2.5	2.5	0.0	3.91	0.17	0.76	1.48	4.50	65.00	14.45
5.00	0.4	2.5	2.5	0.0	5.69	0.17	0.76	1.50	6.16	65.00	10.55
2.50	0.4	2.4	2.4	0.0	7.98	0.17	0.76	1.53	8.38	65.00	7.76
0.00	0.4	2.3	2.3	0.0	10.36	0.17	0.76	1.55	10.71	65.00	6.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	2.3	2.3	0.0	0.37	0.08	0.75	1.13	1.97	65.00	33.06
37.50	0.4	2.4	2.4	0.1	1.56	0.08	0.75	1.10	2.20	65.00	29.51
35.00	0.4	2.4	2.5	0.1	2.67	0.08	0.75	1.08	3.11	65.00	20.91
33.00	0.4	2.5	2.5	0.1	3.49	0.08	0.75	1.06	3.85	65.00	16.88
33.00	0.4	2.5	2.5	0.1	3.54	0.09	0.24	0.30	3.66	65.00	17.75
30.00	0.4	2.6	2.6	0.2	3.73	0.09	0.24	0.28	3.84	65.00	16.91
27.50	0.4	2.6	2.7	0.2	3.78	0.09	0.24	0.28	3.90	65.00	16.65
25.00	0.4	2.7	2.7	0.2	3.76	0.09	0.24	0.29	3.88	65.00	16.74
22.50	0.4	2.8	2.8	0.2	3.65	0.09	0.24	0.31	3.78	65.00	17.20
20.00	0.4	2.8	2.9	0.2	3.46	0.09	0.24	0.34	3.59	65.00	18.10
20.00	0.4	2.8	2.9	0.2	3.51	0.10	1.23	1.57	4.34	65.00	14.96
17.50	0.4	2.9	2.9	0.1	2.44	0.10	1.23	1.60	3.64	65.00	17.88
15.00	0.4	2.9	2.9	0.1	1.90	0.10	1.23	1.62	3.43	65.00	18.97
12.50	0.4	3.0	3.0	0.1	2.04	0.10	1.23	1.65	3.51	65.00	18.54
10.00	0.4	3.0	3.0	0.0	2.82	0.10	1.23	1.68	3.98	65.00	16.33
7.00	0.4	3.0	3.1	0.0	4.61	0.10	1.23	1.71	5.29	65.00	12.29
7.00	0.4	3.0	3.1	0.0	4.67	0.11	2.22	2.95	6.42	65.00	10.12
5.00	0.4	3.0	3.1	0.0	6.57	0.11	2.22	2.97	7.94	65.00	8.18
2.50	0.4	3.1	3.1	0.0	9.01	0.11	2.22	3.00	10.09	65.00	6.44
0.00	0.4	3.1	3.1	0.0	11.54	0.11	2.22	3.03	12.43	65.00	5.23

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.4	1.4	0.0	0.99	0.08	0.75	1.04	1.99	65.00	32.71
37.50	0.2	1.4	1.4	0.0	1.51	0.08	0.75	1.02	2.13	65.00	30.45
35.00	0.2	1.4	1.4	0.1	2.28	0.08	0.75	0.99	2.65	65.00	24.54
33.00	0.2	1.4	1.4	0.1	2.85	0.08	0.75	0.97	3.15	65.00	20.66
33.00	0.2	1.4	1.4	0.1	2.83	0.07	0.62	0.67	3.08	65.00	21.12
30.00	0.2	1.4	1.4	0.1	2.95	0.07	0.62	0.64	3.20	65.00	20.30
27.50	0.2	1.4	1.4	0.1	2.97	0.07	0.62	0.63	3.22	65.00	20.20
25.00	0.2	1.3	1.4	0.1	2.90	0.07	0.62	0.65	3.16	65.00	20.59
22.50	0.2	1.3	1.3	0.1	2.74	0.07	0.62	0.68	3.02	65.00	21.53
20.00	0.2	1.3	1.3	0.1	2.50	0.07	0.62	0.70	2.81	65.00	23.17
20.00	0.2	1.3	1.3	0.1	2.49	0.06	0.48	0.73	2.73	65.00	23.78
17.50	0.2	1.3	1.3	0.1	1.65	0.06	0.48	0.75	1.98	65.00	32.77
15.00	0.2	1.3	1.3	0.1	0.91	0.06	0.48	0.78	1.63	65.00	39.94
12.50	0.2	1.2	1.2	0.0	0.94	0.06	0.48	0.80	1.69	65.00	38.50
10.00	0.2	1.2	1.2	0.0	1.92	0.06	0.48	0.83	2.26	65.00	28.79
7.00	0.2	1.2	1.2	0.0	3.31	0.06	0.48	0.86	3.54	65.00	18.34
7.00	0.2	1.2	1.2	0.0	3.34	0.06	0.34	0.89	3.53	65.00	18.40
5.00	0.2	1.1	1.1	0.0	4.74	0.06	0.34	0.91	4.90	65.00	13.27
2.50	0.2	1.1	1.1	0.0	6.57	0.06	0.34	0.93	6.70	65.00	9.70
0.00	0.2	1.0	1.1	0.0	8.47	0.06	0.34	0.96	8.59	65.00	7.57

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1TC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.0	1.1	0.0	0.77	0.17	0.35	0.63	1.40	65.00	46.31
37.50	0.2	1.1	1.1	0.0	1.55	0.17	0.35	0.60	1.88	65.00	34.60
35.00	0.2	1.1	1.1	0.1	2.33	0.17	0.35	0.58	2.60	65.00	24.98
33.00	0.2	1.2	1.2	0.1	2.89	0.17	0.35	0.55	3.14	65.00	20.69
33.00	0.2	1.2	1.2	0.1	2.87	0.16	0.48	0.53	3.15	65.00	20.62
30.00	0.2	1.2	1.2	0.1	2.99	0.16	0.48	0.50	3.27	65.00	19.91
27.50	0.2	1.2	1.2	0.1	3.01	0.16	0.48	0.50	3.27	65.00	19.87
25.00	0.2	1.3	1.3	0.1	2.93	0.16	0.48	0.52	3.20	65.00	20.33
22.50	0.2	1.3	1.3	0.1	2.78	0.16	0.48	0.55	3.04	65.00	21.35
20.00	0.2	1.3	1.3	0.1	2.54	0.16	0.48	0.58	2.81	65.00	23.12
20.00	0.2	1.3	1.3	0.1	2.53	0.15	0.62	0.88	2.83	65.00	22.98
17.50	0.2	1.3	1.3	0.1	1.69	0.15	0.62	0.90	2.05	65.00	31.77
15.00	0.2	1.3	1.4	0.1	0.99	0.15	0.62	0.93	1.78	65.00	36.52
12.50	0.2	1.4	1.4	0.0	1.06	0.15	0.62	0.96	1.85	65.00	35.22
10.00	0.2	1.4	1.4	0.0	2.01	0.15	0.62	0.98	2.32	65.00	28.01
7.00	0.2	1.4	1.4	0.0	3.43	0.15	0.62	1.01	3.68	65.00	17.69
7.00	0.2	1.4	1.4	0.0	3.46	0.15	0.76	1.32	3.73	65.00	17.41
5.00	0.2	1.4	1.4	0.0	4.89	0.15	0.76	1.34	5.12	65.00	12.69
2.50	0.2	1.4	1.4	0.0	6.74	0.15	0.76	1.36	6.95	65.00	9.35
0.00	0.2	1.4	1.4	0.0	8.68	0.15	0.76	1.39	8.87	65.00	7.33

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	712	2431	2533	338
60.00	151	-43	157	0	713	2533	2631	798
55.00	306	-86	318	0	714	2640	2735	1283
50.00	468	-128	485	0	715	2752	2843	1793
48.00	534	-146	554	0	716	2799	2889	2004
48.00	534	-146	554	0	716	2798	2888	2005
45.00	636	-171	659	0	717	2872	2960	2488
45.00	751	167	770	892	2483	13905	14125	933
40.00	1589	18	1589	892	2485	14032	14251	1768
35.00	2435	-129	2439	892	2469	14163	14377	2670
32.00	2947	-218	2955	892	2470	14245	14457	3213
32.00	2855	-274	2869	916	946	15128	15157	6202
30.00	3219	-297	3233	916	947	15183	15212	6572
30.00	3222	-296	3236	916	941	15388	15417	7065
25.00	4150	-352	4165	916	935	15517	15545	8038
21.25	4851	-395	4867	916	936	15625	15653	8775
21.25	4900	-435	4919	909	3036	16182	16464	11093
20.00	5143	-481	5165	909	3030	16205	16486	11364
15.00	6120	-662	6155	909	3022	16328	16606	12425
10.00	7104	-843	7154	909	3013	16451	16725	13524
5.00	8096	-1023	8160	909	3004	16574	16844	14664
0.00	9095	-1203	9174	909	3004	16731	16999	15802

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	701	2436	2534	328
60.00	151	-42	157	0	701	2539	2635	788
55.00	307	-84	318	0	702	2648	2740	1273
50.00	469	-126	486	0	703	2763	2851	1783
48.00	536	-143	555	0	703	2810	2897	1994
48.00	536	-143	555	0	703	2810	2896	1995
45.00	638	-168	660	0	703	2886	2970	2478
45.00	409	428	592	-2	6098	22069	22896	1752
40.00	1737	62	1738	-2	6099	22197	23020	2611
35.00	3073	-304	3088	-2	6100	22329	23147	3513
32.00	3879	-523	3914	-2	6101	22412	23228	4055
32.00	3283	41	3284	-3	5369	22868	23490	12543
30.00	3833	-88	3834	-3	5369	22925	23545	12912
30.00	3836	-88	3837	-3	5369	23121	23736	13419
25.00	5228	-410	5244	-3	5368	23237	23849	14414
21.25	6276	-651	6309	-3	5369	23348	23957	15151
21.25	6058	-210	6062	-4	4455	24345	24749	21712
20.00	6424	-276	6430	-4	4454	24347	24751	22001
15.00	7889	-544	7908	-4	4450	24436	24838	23093
10.00	9360	-811	9395	-4	4445	24519	24919	24228
5.00	10836	-1077	10889	-4	4438	24599	24996	25405
0.00	12316	-1344	12389	-4	4438	24756	25151	26543

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	2	0	2	0	690	2437	2533	338
60.00	151	-41	157	0	690	2539	2631	798
55.00	307	-83	318	0	690	2646	2735	1283
50.00	469	-124	485	0	690	2758	2844	1793
48.00	536	-141	554	0	690	2805	2889	2004
48.00	536	-141	554	0	690	2805	2888	2005
45.00	638	-166	659	0	691	2879	2960	2488
45.00	752	110	760	-895	3728	13928	14418	3455
40.00	1591	-114	1596	-895	3738	14048	14537	4304
35.00	2438	-339	2462	-895	3746	14173	14660	5193
32.00	2950	-473	2988	-895	3746	14255	14739	5735
32.00	2859	149	2863	-920	6023	15137	16291	11077
30.00	3223	4	3223	-920	6023	15192	16342	11446
30.00	3226	4	3226	-920	6029	15388	16527	11939
25.00	4153	-358	4169	-920	6035	15507	16640	12913
21.25	4853	-630	4894	-920	6036	15615	16741	13650
21.25	4903	-143	4905	-913	4859	16166	16880	17821
20.00	5145	-216	5150	-913	4862	16178	16893	18093
15.00	6120	-509	6142	-913	4866	16285	16996	19153
10.00	7102	-801	7147	-913	4868	16390	17098	20253
5.00	8090	-1094	8164	-913	4867	16495	17198	21392
0.00	9084	-1386	9189	-913	4868	16652	17349	22531

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-544	339	641	114	1626	9588	9725	-2024
37.50	-257	288	386	114	1810	9531	9701	-2029
35.00	28	231	232	114	1996	9475	9683	-2029
33.00	254	181	312	114	2142	9430	9671	-2029
33.00	254	181	312	114	915	2854	2997	-323
30.00	356	144	384	114	1139	2787	3011	-323
27.50	439	107	452	114	1325	2732	3036	-322
25.00	520	65	524	114	1511	2676	3073	-320
22.50	599	17	600	114	1696	2622	3122	-316
20.00	677	-37	678	114	1883	2566	3182	-316
20.00	677	-37	678	114	667	-4020	4074	1362
17.50	556	-60	559	114	855	-4076	4165	1358
15.00	433	-88	442	114	1042	-4133	4262	1355
12.50	308	-122	331	114	1230	-4189	4366	1353
10.00	181	-162	243	114	1417	-4245	4475	1352
7.00	27	-217	219	114	1641	-4311	4613	1352
7.00	27	-217	219	114	434	-10903	10912	3009
5.00	-235	-229	328	114	583	-10948	10963	3009
2.50	-564	-250	617	114	773	-10999	11026	3025
0.00	-895	-276	936	114	960	-11054	11096	3025

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-892	339	954	-115	1562	11031	11141	-1779
37.50	-561	289	632	-115	1751	10973	11112	-1790
35.00	-233	234	330	-115	1938	10918	11089	-1790
33.00	28	186	188	-115	2089	10872	11071	-1795
33.00	28	186	188	-115	882	4302	4392	-53
30.00	182	150	236	-115	1108	4235	4378	-52
27.50	308	114	329	-115	1296	4179	4375	-50
25.00	433	72	439	-115	1483	4123	4382	-47
22.50	556	25	556	-115	1671	4067	4397	-43
20.00	677	-28	677	-115	1858	4011	4420	-43
20.00	677	-28	677	-115	642	-2564	2643	1681
17.50	599	-50	601	-115	828	-2621	2749	1678
15.00	520	-78	525	-115	1015	-2677	2863	1678
12.50	438	-111	452	-115	1201	-2735	2987	1676
10.00	355	-150	386	-115	1386	-2793	3118	1674
7.00	254	-204	325	-115	1609	-2861	3283	1672
7.00	254	-204	325	-115	381	-9441	9449	3366
5.00	27	-215	217	-115	530	-9486	9501	3366
2.50	-259	-233	349	-115	709	-9541	9568	3371
0.00	-546	-258	604	-115	896	-9597	9639	3371

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	136	-76	156	297	-3058	225	3066	2263
37.50	142	13	142	297	-2871	167	2876	2263
35.00	146	96	175	297	-2684	109	2686	2264
33.00	148	158	217	297	-2535	65	2536	2264
33.00	148	159	217	168	-735	-13	735	2266
30.00	147	181	233	168	-510	-80	516	2267
27.50	143	194	241	168	-322	-136	350	2267
25.00	138	200	244	168	-135	-191	234	2267
22.50	132	202	241	168	53	-247	252	2267
20.00	124	197	233	168	240	-302	385	2267
20.00	124	198	233	38	2040	-375	2074	2265
17.50	111	134	174	38	2227	-430	2268	2265
15.00	98	64	117	38	2415	-485	2463	2264
12.50	82	-11	83	38	2602	-540	2657	2264
10.00	65	-92	113	38	2788	-595	2851	2264
7.00	43	-197	201	38	3013	-660	3084	2264
7.00	43	-196	201	-91	4811	-733	4867	2263
5.00	25	-314	315	-91	4960	-778	5020	2266
2.50	0	-465	465	-91	5145	-834	5212	2270
0.00	-25	-622	623	-91	5332	-888	5405	2270

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-24	-56	61	91	-2979	885	3108	1519
37.50	1	31	31	91	-2792	830	2913	1519
35.00	25	112	115	91	-2605	774	2718	1520
33.00	43	173	178	91	-2456	731	2562	1520
33.00	44	172	178	-38	-656	658	929	1523
30.00	66	192	203	-38	-431	592	733	1523
27.50	83	202	218	-38	-243	537	590	1524
25.00	98	206	229	-38	-56	482	485	1524
22.50	112	205	234	-38	131	427	447	1524
20.00	124	198	234	-38	319	372	490	1524
20.00	124	198	234	-168	2118	299	2139	1522
17.50	132	132	187	-168	2306	243	2318	1522
15.00	138	60	151	-168	2493	188	2500	1522
12.50	143	-18	144	-168	2680	130	2683	1521
10.00	146	-101	178	-168	2866	73	2867	1522
7.00	148	-208	255	-168	3091	7	3091	1522
7.00	148	-208	255	-298	4889	-72	4890	1522
5.00	145	-327	358	-298	5038	-120	5039	1524
2.50	141	-481	502	-298	5223	-179	5226	1528
0.00	135	-641	655	-298	5410	-234	5415	1529

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	23	-52	57	109	-2340	506	2394	-1185
37.50	37	15	40	109	-2153	451	2200	-1185
35.00	50	77	92	109	-1966	396	2006	-1184
33.00	59	122	136	109	-1817	352	1850	-1184
33.00	59	122	136	89	-649	283	708	-1183
30.00	68	142	157	89	-425	217	477	-1183
27.50	73	152	169	89	-238	163	288	-1183
25.00	77	156	174	89	-52	108	120	-1183
22.50	80	155	174	89	135	54	145	-1183
20.00	81	148	169	89	322	0	322	-1183
20.00	81	148	169	69	1489	-68	1491	-1184
17.50	78	101	127	69	1676	-122	1681	-1184
15.00	73	47	87	69	1863	-176	1872	-1184
12.50	67	-11	68	69	2051	-230	2063	-1184
10.00	60	-76	96	69	2238	-284	2256	-1184
7.00	48	-160	167	69	2462	-349	2487	-1184
7.00	48	-160	167	49	3631	-415	3654	-1184
5.00	38	-249	252	49	3780	-459	3808	-1184
2.50	23	-365	366	49	3968	-513	4001	-1183
0.00	7	-487	487	49	4156	-566	4194	-1180

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	7	-41	42	-49	-2303	565	2372	-2104
37.50	24	25	34	-49	-2116	511	2177	-2104
35.00	38	86	94	-49	-1929	457	1983	-2104
33.00	49	130	139	-49	-1780	414	1827	-2104
33.00	49	130	139	-69	-612	347	704	-2102
30.00	60	148	160	-69	-388	282	480	-2102
27.50	68	157	171	-69	-201	228	304	-2102
25.00	74	160	176	-69	-14	174	175	-2102
22.50	78	158	176	-69	172	120	210	-2102
20.00	81	150	170	-69	359	66	365	-2102
20.00	81	150	170	-89	1526	-2	1526	-2103
17.50	80	101	129	-89	1713	-57	1713	-2103
15.00	77	47	91	-89	1900	-111	1903	-2103
12.50	73	-13	74	-89	2086	-166	2093	-2103
10.00	68	-78	103	-89	2274	-221	2285	-2103
7.00	58	-164	174	-89	2498	-286	2515	-2103
7.00	58	-164	174	-109	3666	-356	3684	-2103
5.00	49	-254	258	-109	3817	-400	3838	-2102
2.50	36	-371	373	-109	4004	-455	4030	-2102
0.00	22	-494	494	-109	4192	-510	4223	-2099

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	8.9	8.9	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	0.8	7.8	7.9	0.1	1.51	0.04	0.00	0.29	1.55	65.00	41.91
55.00	0.7	6.8	6.9	0.0	2.75	0.07	0.00	0.28	2.82	65.00	23.05
50.00	0.6	5.8	5.9	0.0	3.81	0.09	0.00	0.28	3.89	65.00	16.69
48.00	0.6	5.5	5.5	0.0	4.18	0.10	0.00	0.28	4.28	65.00	15.20
48.00	0.6	5.5	5.5	0.0	2.83	0.06	0.00	0.19	2.89	65.00	22.47
45.00	0.5	4.9	4.9	0.0	3.18	0.08	0.00	0.19	3.26	65.00	19.95
45.00	0.5	4.9	4.9	0.0	3.71	0.03	2.10	2.99	5.80	65.00	11.20
40.00	0.4	4.0	4.0	0.0	6.78	0.05	1.92	2.77	7.80	65.00	8.33
35.00	0.4	3.1	3.1	0.0	9.63	0.08	1.76	2.59	10.21	65.00	6.36
32.00	0.3	2.6	2.7	0.0	11.14	0.09	1.67	2.48	11.63	65.00	5.59
32.00	0.3	2.6	2.7	0.0	10.86	0.17	1.72	2.57	11.50	65.00	5.65
30.00	0.3	2.3	2.4	0.0	11.83	0.18	1.66	2.50	12.42	65.00	5.23
30.00	0.3	2.3	2.4	0.0	11.84	0.19	1.66	2.52	12.45	65.00	5.22
25.00	0.2	1.6	1.7	0.0	14.05	0.21	1.53	2.36	14.56	65.00	4.46
21.25	0.1	1.2	1.2	0.0	15.48	0.22	1.45	2.26	15.95	65.00	4.08
21.25	0.1	1.2	1.2	0.0	15.67	0.28	1.44	2.29	16.16	65.00	4.02
20.00	0.1	1.1	1.1	0.0	16.15	0.29	1.41	2.25	16.64	65.00	3.91
15.00	0.1	0.6	0.6	0.0	17.91	0.30	1.31	2.13	18.37	65.00	3.54
10.00	0.0	0.3	0.3	0.0	19.41	0.32	1.22	2.01	19.85	65.00	3.27
5.00	0.0	0.1	0.1	0.0	20.68	0.33	1.14	1.91	21.12	65.00	3.08
0.00	0.0	0.0	0.0	0.0	21.77	0.35	1.06	1.82	22.20	65.00	2.93

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	11.3	11.4	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	0.8	10.0	10.1	0.1	1.51	0.04	0.00	0.29	1.55	65.00	41.89
55.00	0.7	8.8	8.8	0.1	2.76	0.07	0.00	0.28	2.82	65.00	23.03
50.00	0.6	7.6	7.6	0.1	3.81	0.09	0.00	0.28	3.90	65.00	16.67
48.00	0.6	7.1	7.1	0.1	4.19	0.10	0.00	0.28	4.28	65.00	15.17
48.00	0.6	7.1	7.1	0.1	2.83	0.06	0.00	0.19	2.90	65.00	22.44
45.00	0.5	6.4	6.4	0.1	3.19	0.08	0.00	0.19	3.26	65.00	19.92
45.00	0.5	6.4	6.4	0.1	2.86	0.05	0.00	1.45	3.66	65.00	17.75
40.00	0.4	5.2	5.2	0.0	7.46	0.08	0.00	1.39	7.64	65.00	8.51
35.00	0.3	4.1	4.1	0.0	12.30	0.10	0.00	1.34	12.40	65.00	5.24
32.00	0.3	3.5	3.5	0.0	14.90	0.11	0.00	1.31	15.01	65.00	4.33
32.00	0.3	3.5	3.5	0.0	12.21	0.35	0.01	1.33	12.61	65.00	5.15
30.00	0.3	3.1	3.1	0.0	13.83	0.35	0.01	1.31	14.19	65.00	4.58
30.00	0.3	3.1	3.1	0.0	13.84	0.37	0.01	1.32	14.21	65.00	4.57
25.00	0.2	2.2	2.2	0.0	17.67	0.38	0.01	1.28	18.05	65.00	3.60
21.25	0.1	1.6	1.6	0.0	20.14	0.39	0.01	1.24	20.53	65.00	3.17
21.25	0.1	1.6	1.6	0.0	19.10	0.56	0.01	1.28	19.65	65.00	3.31
20.00	0.1	1.4	1.4	0.0	19.91	0.56	0.01	1.27	20.47	65.00	3.18
15.00	0.1	0.8	0.8	0.0	22.86	0.56	0.01	1.23	23.42	65.00	2.78
10.00	0.0	0.4	0.4	0.0	25.36	0.57	0.01	1.19	25.93	65.00	2.51
5.00	0.0	0.1	0.1	0.0	27.49	0.58	0.00	1.15	28.07	65.00	2.32
0.00	0.0	0.0	0.0	0.0	29.30	0.59	0.00	1.12	29.88	65.00	2.18

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	8.9	8.9	0.1	0.02	0.02	0.00	0.29	0.51	65.00	99.90
60.00	0.8	7.8	7.9	0.1	1.51	0.04	0.00	0.29	1.55	65.00	41.91
55.00	0.7	6.8	6.9	0.1	2.75	0.07	0.00	0.28	2.82	65.00	23.05
50.00	0.6	5.8	5.9	0.0	3.81	0.09	0.00	0.28	3.89	65.00	16.69
48.00	0.6	5.5	5.5	0.0	4.18	0.10	0.00	0.28	4.28	65.00	15.20
48.00	0.6	5.5	5.5	0.0	2.83	0.06	0.00	0.19	2.89	65.00	22.47
45.00	0.5	4.9	4.9	0.0	3.18	0.08	0.00	0.19	3.26	65.00	19.95
45.00	0.5	4.9	4.9	0.0	3.64	0.11	2.11	3.02	5.87	65.00	11.08
40.00	0.4	4.0	4.0	0.0	6.90	0.13	1.92	2.80	7.91	65.00	8.22
35.00	0.3	3.1	3.1	0.0	9.86	0.15	1.76	2.61	10.46	65.00	6.21
32.00	0.3	2.6	2.7	0.0	11.41	0.16	1.68	2.51	11.92	65.00	5.45
32.00	0.3	2.6	2.7	0.0	10.74	0.31	1.72	2.64	11.73	65.00	5.54
30.00	0.3	2.3	2.3	0.0	11.56	0.31	1.67	2.57	12.48	65.00	5.21
30.00	0.3	2.3	2.3	0.0	11.57	0.33	1.67	2.58	12.50	65.00	5.20
25.00	0.2	1.6	1.7	0.0	14.06	0.34	1.54	2.42	14.68	65.00	4.43
21.25	0.2	1.2	1.2	0.0	15.68	0.35	1.45	2.32	16.26	65.00	4.00
21.25	0.2	1.2	1.2	0.0	15.43	0.46	1.44	2.32	16.09	65.00	4.04
20.00	0.1	1.1	1.1	0.0	15.94	0.46	1.42	2.28	16.59	65.00	3.92
15.00	0.1	0.6	0.6	0.0	17.80	0.47	1.32	2.16	18.41	65.00	3.53
10.00	0.0	0.3	0.3	0.0	19.38	0.48	1.23	2.04	19.97	65.00	3.25
5.00	0.0	0.1	0.1	0.0	20.72	0.49	1.14	1.94	21.30	65.00	3.05
0.00	0.0	0.0	0.0	0.0	21.86	0.50	1.07	1.84	22.43	65.00	2.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	6.4	6.4	0.1	10.07	0.14	0.88	2.23	10.40	65.00	6.25
37.50	0.5	6.4	6.4	0.1	5.80	0.14	0.88	2.23	6.88	65.00	9.45
35.00	0.5	6.4	6.4	0.1	3.56	0.14	0.88	2.23	5.31	65.00	12.24
33.00	0.5	6.4	6.4	0.1	4.84	0.14	0.88	2.22	5.83	65.00	11.15
33.00	0.5	6.4	6.4	0.1	4.84	0.02	0.88	1.29	5.25	65.00	12.37
30.00	0.5	6.4	6.4	0.1	6.11	0.02	0.88	1.29	6.46	65.00	10.06
27.50	0.5	6.4	6.4	0.1	7.10	0.02	0.88	1.30	7.42	65.00	8.76
25.00	0.5	6.4	6.4	0.1	8.04	0.02	0.88	1.30	8.33	65.00	7.81
22.50	0.5	6.3	6.4	0.1	8.91	0.02	0.88	1.31	9.19	65.00	7.08
20.00	0.5	6.2	6.3	0.0	10.18	0.02	0.88	1.32	10.34	65.00	6.28
20.00	0.5	6.2	6.3	0.0	10.18	0.09	0.88	1.44	10.32	65.00	6.30
17.50	0.5	6.1	6.1	0.0	8.53	0.09	0.88	1.46	8.69	65.00	7.48
15.00	0.5	6.0	6.0	0.0	6.90	0.09	0.88	1.47	7.13	65.00	9.12
12.50	0.5	5.8	5.8	0.0	5.27	0.09	0.88	1.48	5.62	65.00	11.57
10.00	0.5	5.6	5.6	0.0	3.65	0.09	0.88	1.50	4.28	65.00	15.18
7.00	0.5	5.4	5.4	0.0	3.36	0.09	0.88	1.52	4.19	65.00	15.51
7.00	0.5	5.4	5.4	0.0	3.36	0.20	0.88	2.40	5.14	65.00	12.65
5.00	0.5	5.2	5.3	0.0	4.85	0.20	0.88	2.40	6.03	65.00	10.78
2.50	0.5	5.0	5.1	0.0	9.81	0.21	0.88	2.41	10.04	65.00	6.47
0.00	0.5	4.9	4.9	0.0	14.83	0.21	0.88	2.42	15.05	65.00	4.32

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	4.9	4.9	0.0	15.17	0.12	0.88	2.43	15.31	65.00	4.24
37.50	0.5	5.0	5.1	0.1	10.02	0.12	0.88	2.43	10.18	65.00	6.39
35.00	0.5	5.2	5.3	0.1	4.86	0.12	0.88	2.43	6.06	65.00	10.73
33.00	0.5	5.4	5.4	0.1	2.90	0.12	0.88	2.43	4.99	65.00	13.03
33.00	0.5	5.4	5.4	0.1	2.90	0.00	0.88	1.49	3.87	65.00	16.79
30.00	0.5	5.6	5.6	0.1	3.59	0.00	0.88	1.49	4.22	65.00	15.39
27.50	0.5	5.8	5.8	0.1	5.22	0.00	0.88	1.49	5.67	65.00	11.47
25.00	0.5	6.0	6.0	0.1	6.80	0.00	0.88	1.49	7.16	65.00	9.08
22.50	0.5	6.1	6.1	0.1	8.32	0.00	0.88	1.49	8.62	65.00	7.54
20.00	0.5	6.2	6.3	0.0	10.12	0.00	0.88	1.50	10.24	65.00	6.35
20.00	0.5	6.2	6.3	0.0	10.12	0.11	0.88	1.25	10.41	65.00	6.24
17.50	0.5	6.3	6.4	0.0	9.11	0.11	0.88	1.26	9.43	65.00	6.89
15.00	0.5	6.4	6.4	0.0	8.11	0.11	0.88	1.28	8.47	65.00	7.68
12.50	0.5	6.4	6.4	0.0	7.12	0.11	0.88	1.30	7.52	65.00	8.64
10.00	0.5	6.4	6.4	0.0	6.14	0.11	0.88	1.31	6.59	65.00	9.86
7.00	0.5	6.4	6.4	0.0	4.97	0.11	0.88	1.34	5.52	65.00	11.78
7.00	0.5	6.4	6.4	0.0	4.97	0.23	0.88	2.20	6.02	65.00	10.80
5.00	0.5	6.4	6.4	0.0	3.32	0.23	0.88	2.21	5.14	65.00	12.64
2.50	0.5	6.4	6.4	0.0	5.23	0.23	0.88	2.21	6.35	65.00	10.24
0.00	0.5	6.4	6.4	0.1	9.59	0.23	0.88	2.22	10.07	65.00	6.45

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	3.5	3.5	0.0	2.46	0.15	2.28	2.71	5.34	65.00	12.18
37.50	0.3	3.5	3.5	0.1	2.16	0.15	2.28	2.68	5.15	65.00	12.61
35.00	0.3	3.4	3.5	0.1	2.73	0.15	2.28	2.65	5.38	65.00	12.09
33.00	0.3	3.4	3.4	0.1	3.23	0.15	2.28	2.63	5.58	65.00	11.64
33.00	0.3	3.4	3.4	0.1	3.23	0.15	1.29	1.39	4.09	65.00	15.88
30.00	0.3	3.4	3.4	0.2	3.55	0.15	1.29	1.36	4.36	65.00	14.91
27.50	0.3	3.4	3.4	0.2	3.72	0.15	1.29	1.34	4.50	65.00	14.45
25.00	0.3	3.3	3.3	0.2	3.79	0.15	1.29	1.32	4.56	65.00	14.26
22.50	0.3	3.3	3.3	0.2	3.77	0.15	1.29	1.32	4.54	65.00	14.33
20.00	0.3	3.2	3.2	0.2	3.65	0.15	1.29	1.34	4.43	65.00	14.66
20.00	0.3	3.2	3.2	0.2	3.66	0.15	0.29	0.58	3.83	65.00	16.97
17.50	0.3	3.2	3.2	0.1	2.64	0.15	0.29	0.61	2.82	65.00	23.02
15.00	0.3	3.1	3.1	0.1	1.83	0.15	0.29	0.64	1.98	65.00	32.82
12.50	0.3	3.0	3.0	0.1	1.28	0.15	0.29	0.66	1.60	65.00	40.60
10.00	0.3	3.0	3.0	0.0	1.75	0.15	0.29	0.69	1.91	65.00	34.01
7.00	0.3	2.9	2.9	0.0	3.15	0.15	0.29	0.72	3.31	65.00	19.66
7.00	0.3	2.9	2.9	0.0	3.15	0.15	0.70	1.38	3.77	65.00	17.25
5.00	0.3	2.8	2.8	0.0	4.76	0.15	0.70	1.40	5.25	65.00	12.39
2.50	0.3	2.7	2.7	0.0	6.84	0.15	0.70	1.43	7.24	65.00	8.98
0.00	0.3	2.6	2.7	0.0	9.30	0.15	0.70	1.45	9.50	65.00	6.84

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.6	2.7	0.0	0.97	0.10	0.70	1.13	1.96	65.00	33.18
37.50	0.3	2.7	2.7	0.1	0.46	0.10	0.70	1.10	1.91	65.00	34.02
35.00	0.3	2.8	2.8	0.1	1.80	0.10	0.70	1.08	2.29	65.00	28.38
33.00	0.3	2.9	2.9	0.1	2.80	0.10	0.70	1.05	3.17	65.00	20.50
33.00	0.3	2.9	2.9	0.1	2.80	0.10	0.29	0.42	2.96	65.00	21.96
30.00	0.3	3.0	3.0	0.2	3.22	0.10	0.29	0.40	3.38	65.00	19.24
27.50	0.3	3.0	3.0	0.2	3.47	0.10	0.29	0.38	3.63	65.00	17.92
25.00	0.3	3.1	3.1	0.2	3.63	0.10	0.29	0.36	3.79	65.00	17.17
22.50	0.3	3.2	3.2	0.2	3.70	0.10	0.29	0.36	3.85	65.00	16.87
20.00	0.3	3.2	3.2	0.2	3.67	0.10	0.29	0.36	3.83	65.00	16.98
20.00	0.3	3.2	3.2	0.2	3.67	0.10	1.29	1.59	4.52	65.00	14.38
17.50	0.3	3.3	3.3	0.1	2.74	0.10	1.29	1.61	3.97	65.00	16.37
15.00	0.3	3.3	3.3	0.1	2.40	0.10	1.29	1.64	3.76	65.00	17.29
12.50	0.3	3.4	3.4	0.1	2.21	0.10	1.29	1.66	3.65	65.00	17.82
10.00	0.3	3.4	3.4	0.0	2.76	0.10	1.29	1.69	4.05	65.00	16.04
7.00	0.3	3.4	3.4	0.0	3.96	0.10	1.29	1.72	4.78	65.00	13.60
7.00	0.3	3.4	3.4	0.0	3.96	0.10	2.28	2.96	6.17	65.00	10.54
5.00	0.3	3.4	3.5	0.0	5.70	0.10	2.28	2.98	7.31	65.00	8.90
2.50	0.3	3.5	3.5	0.0	7.93	0.10	2.28	3.01	9.20	65.00	7.07
0.00	0.3	3.5	3.5	0.0	10.24	0.10	2.28	3.04	11.28	65.00	5.76

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.6	1.6	0.0	0.90	0.08	0.83	1.17	2.09	65.00	31.10
37.50	0.1	1.6	1.6	0.0	0.64	0.08	0.83	1.14	2.02	65.00	32.22
35.00	0.1	1.6	1.6	0.1	1.44	0.08	0.83	1.11	2.16	65.00	30.13
33.00	0.1	1.6	1.6	0.1	2.16	0.08	0.83	1.09	2.62	65.00	24.85
33.00	0.1	1.6	1.6	0.1	2.16	0.08	0.68	0.78	2.53	65.00	25.68
30.00	0.1	1.6	1.6	0.1	2.50	0.08	0.68	0.75	2.84	65.00	22.90
27.50	0.1	1.6	1.6	0.1	2.68	0.08	0.68	0.72	3.01	65.00	21.63
25.00	0.1	1.6	1.6	0.1	2.77	0.08	0.68	0.70	3.09	65.00	21.04
22.50	0.1	1.5	1.5	0.1	2.76	0.08	0.68	0.70	3.09	65.00	21.05
20.00	0.1	1.5	1.5	0.1	2.67	0.08	0.68	0.73	3.00	65.00	21.66
20.00	0.1	1.5	1.5	0.1	2.67	0.08	0.53	0.74	2.94	65.00	22.13
17.50	0.1	1.5	1.5	0.1	1.95	0.08	0.53	0.76	2.28	65.00	28.45
15.00	0.1	1.5	1.5	0.1	1.37	0.08	0.53	0.79	1.96	65.00	33.24
12.50	0.1	1.4	1.4	0.1	1.06	0.08	0.53	0.82	1.80	65.00	36.13
10.00	0.1	1.4	1.4	0.0	1.47	0.08	0.53	0.84	2.02	65.00	32.18
7.00	0.2	1.3	1.3	0.0	2.65	0.08	0.53	0.88	2.99	65.00	21.75
7.00	0.2	1.3	1.3	0.0	2.65	0.08	0.38	0.88	2.93	65.00	22.15
5.00	0.2	1.3	1.3	0.0	3.89	0.08	0.38	0.91	4.12	65.00	15.77
2.50	0.2	1.3	1.3	0.0	5.51	0.08	0.38	0.93	5.70	65.00	11.39
0.00	0.2	1.2	1.2	0.0	7.20	0.08	0.38	0.96	7.38	65.00	8.81

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 1LC2 NESC Heavy

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.2	1.2	0.0	0.65	0.14	0.38	0.71	1.32	65.00	49.13
37.50	0.1	1.3	1.3	0.0	0.51	0.14	0.38	0.68	1.26	65.00	51.43
35.00	0.1	1.3	1.3	0.1	1.49	0.14	0.38	0.65	1.79	65.00	36.31
33.00	0.1	1.3	1.3	0.1	2.21	0.14	0.38	0.63	2.46	65.00	26.40
33.00	0.1	1.3	1.3	0.1	2.21	0.14	0.53	0.63	2.52	65.00	25.83
30.00	0.1	1.4	1.4	0.1	2.54	0.14	0.53	0.60	2.83	65.00	22.97
27.50	0.1	1.4	1.4	0.1	2.72	0.14	0.53	0.57	3.00	65.00	21.70
25.00	0.1	1.5	1.5	0.1	2.80	0.14	0.53	0.55	3.08	65.00	21.14
22.50	0.1	1.5	1.5	0.1	2.80	0.14	0.53	0.56	3.07	65.00	21.20
20.00	0.1	1.5	1.5	0.1	2.70	0.14	0.53	0.58	2.97	65.00	21.89
20.00	0.1	1.5	1.5	0.1	2.70	0.14	0.68	0.89	3.02	65.00	21.50
17.50	0.1	1.5	1.5	0.1	1.98	0.14	0.68	0.92	2.36	65.00	27.56
15.00	0.1	1.6	1.6	0.1	1.43	0.14	0.68	0.95	2.04	65.00	31.79
12.50	0.1	1.6	1.6	0.1	1.15	0.14	0.68	0.97	1.94	65.00	33.45
10.00	0.1	1.6	1.6	0.0	1.56	0.14	0.68	1.00	2.16	65.00	30.09
7.00	0.1	1.6	1.6	0.0	2.77	0.14	0.68	1.03	3.04	65.00	21.38
7.00	0.1	1.6	1.6	0.0	2.77	0.14	0.83	1.34	3.22	65.00	20.22
5.00	0.1	1.6	1.6	0.0	4.03	0.14	0.83	1.37	4.32	65.00	15.05
2.50	0.1	1.6	1.6	0.0	5.68	0.14	0.83	1.39	5.90	65.00	11.02
0.00	0.1	1.6	1.6	0.0	7.40	0.14	0.83	1.42	7.60	65.00	8.56

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	591	1408	1527	715
60.00	85	-52	99	0	972	1412	1714	1052
55.00	169	-122	209	0	1374	1415	1972	1408
50.00	254	-217	335	0	1797	1418	2289	1782
48.00	288	-262	390	0	1972	1419	2430	1937
48.00	288	-262	390	0	1972	1419	2430	1937
45.00	340	-338	479	0	2241	1423	2655	2291
45.00	483	-120	498	1112	1245	15006	15058	4964
40.00	1384	-208	1400	1112	1696	15010	15106	5589
35.00	2285	-324	2308	1112	2171	15013	15169	6245
32.00	2826	-407	2855	1112	2473	15017	15219	6642
32.00	2860	24	2860	1099	5691	15260	16286	6441
30.00	3226	-115	3228	1099	5896	15262	16362	6711
30.00	3226	-127	3228	1099	6096	15258	16663	6947
25.00	4141	-544	4177	1099	7214	15257	16876	7668
21.25	4828	-878	4907	1099	7623	15261	17059	8208
21.25	4906	-518	4934	1047	10641	15289	18628	8249
20.00	5136	-679	5180	1047	10774	15283	18699	8454
15.00	6053	-1342	6200	1047	11331	15274	19018	9243
10.00	6970	-2039	7262	1047	11907	15261	19357	10063
5.00	7885	-2771	8358	1047	12502	15244	19715	10913
0.00	8800	-3540	9485	1047	13131	15245	20121	11748

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	583	1415	1530	708
60.00	85	-51	99	0	964	1422	1718	1045
55.00	171	-121	209	0	1366	1429	1977	1401
50.00	257	-216	335	0	1789	1437	2294	1775
48.00	291	-261	391	0	1964	1440	2435	1929
48.00	291	-261	391	0	1963	1440	2435	1930
45.00	343	-336	480	0	2232	1447	2660	2284
45.00	61	901	903	5	10814	25095	27326	13219
40.00	1567	239	1585	5	11281	25094	27514	13854
35.00	3073	-453	3106	5	11765	25089	27710	14527
32.00	3976	-882	4073	5	12067	25096	27846	14925
32.00	3533	373	3553	0	11782	24294	27000	19806
30.00	4116	88	4117	0	11987	24299	27095	20076
30.00	4116	76	4117	1	12794	24272	27438	20331
25.00	5573	-707	5617	1	13316	24240	27657	21080
21.25	6664	-1316	6792	1	13725	24247	27862	21620
21.25	6440	-238	6444	-1	12397	24161	27156	26185
20.00	6802	-425	6815	0	12531	24119	27180	26411
15.00	8249	-1194	8335	0	13089	24050	27381	27236
10.00	9693	-1997	9896	0	13660	23972	27591	28096
5.00	11131	-2835	11486	0	14247	23886	27812	28988
0.00	12564	-3709	13100	0	14876	23888	28141	29823

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	575	1415	1527	716
60.00	85	-51	99	0	956	1422	1714	1052
55.00	171	-120	209	0	1358	1430	1972	1408
50.00	257	-214	334	0	1781	1437	2289	1782
48.00	291	-259	390	0	1956	1441	2429	1937
48.00	291	-259	390	0	1956	1441	2429	1937
45.00	343	-334	479	0	2224	1447	2654	2291
45.00	482	721	867	-1107	7904	15031	16983	10174
40.00	1384	233	1403	-1107	8384	15026	17207	10798
35.00	2286	-285	2303	-1107	8879	15020	17449	11454
32.00	2826	-611	2892	-1107	9180	15027	17609	11851
32.00	2856	219	2864	-1097	8796	15687	17985	16898
30.00	3232	6	3232	-1097	9001	15691	18090	17169
30.00	3233	-7	3233	-1097	9815	15672	18492	17405
25.00	4173	-612	4218	-1097	10347	15648	18759	18127
21.25	4877	-1087	4997	-1097	10756	15654	18993	18668
21.25	4952	-359	4965	-1045	11584	15750	19551	23143
20.00	5188	-534	5215	-1045	11723	15718	19609	23349
15.00	6131	-1255	6258	-1045	12288	15669	19913	24139
10.00	7071	-2011	7351	-1045	12868	15614	20233	24961
5.00	8008	-2802	8484	-1045	13463	15554	20572	25813
0.00	8941	-3629	9649	-1045	14093	15556	20990	26648

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-683	143	698	138	-2860	11835	12176	-890
37.50	-328	227	399	138	-2727	11831	12141	-895
35.00	27	306	308	138	-2590	11828	12109	-895
33.00	310	367	481	138	-2484	11826	12084	-894
33.00	310	367	481	138	347	3370	3388	1322
30.00	432	352	557	138	512	3367	3406	1322
27.50	532	335	629	138	648	3363	3425	1327
25.00	633	313	706	138	786	3359	3449	1330
22.50	734	288	788	138	923	3354	3479	1334
20.00	835	258	873	138	1061	3351	3515	1333
20.00	835	258	873	138	3915	-5112	6439	3493
17.50	681	138	695	138	4053	-5116	6526	3493
15.00	527	15	528	138	4193	-5122	6620	3486
12.50	374	-113	390	138	4333	-5129	6714	3478
10.00	220	-245	329	138	4471	-5133	6807	3478
7.00	35	-409	411	138	4637	-5137	6920	3478
7.00	35	-409	411	138	7501	-13600	15532	5614
5.00	-291	-591	659	138	7612	-13603	15588	5613
2.50	-699	-821	1078	138	7744	-13593	15644	5654
0.00	-1107	-1055	1530	138	7881	-13596	15715	5655

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1112	219	1133	-144	-2665	13586	13845	979
37.50	-704	297	764	-144	-2528	13585	13818	979
35.00	-297	371	475	-144	-2386	13587	13795	965
33.00	29	426	427	-144	-2272	13587	13776	959
33.00	29	426	427	-144	593	5158	5192	3232
30.00	215	402	456	-144	762	5156	5212	3233
27.50	370	377	528	-144	900	5155	5233	3233
25.00	524	348	629	-144	1045	5149	5254	3240
22.50	679	314	748	-144	1186	5144	5279	3245
20.00	833	277	878	-144	1324	5142	5310	3245
20.00	833	277	878	-144	4179	-3307	5329	5477
17.50	734	149	749	-144	4317	-3308	5439	5476
15.00	634	18	635	-144	4456	-3319	5556	5471
12.50	535	-118	548	-144	4591	-3335	5674	5465
10.00	435	-258	505	-144	4728	-3337	5787	5465
7.00	314	-431	533	-144	4890	-3346	5925	5464
7.00	314	-431	533	-144	7721	-11810	14110	7657
5.00	31	-618	619	-144	7832	-11812	14172	7657
2.50	-324	-854	914	-144	7943	-11816	14237	7682
0.00	-679	-1095	1288	-144	8080	-11818	14317	7683

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	220	425	478	220	194	-606	637	-1664
37.50	202	417	463	220	331	-608	692	-1664
35.00	183	405	445	220	467	-610	768	-1664
33.00	169	392	427	220	577	-612	841	-1664
33.00	201	392	441	156	1456	-625	1584	-1243
30.00	179	337	381	156	1620	-627	1737	-1244
27.50	160	286	328	156	1757	-629	1866	-1246
25.00	141	231	271	156	1895	-630	1997	-1247
22.50	122	172	211	156	2032	-631	2128	-1247
20.00	103	109	150	156	2170	-634	2261	-1248
20.00	135	109	174	93	3051	-646	3119	-829
17.50	116	15	117	93	3189	-648	3254	-829
15.00	96	-82	127	93	3327	-650	3390	-829
12.50	77	-184	200	93	3465	-652	3526	-829
10.00	57	-290	296	93	3603	-654	3662	-828
7.00	34	-423	424	93	3769	-656	3826	-826
7.00	66	-423	428	29	4649	-668	4697	-403
5.00	50	-536	538	29	4760	-670	4806	-403
2.50	30	-681	682	29	4897	-672	4943	-399
0.00	10	-830	830	29	5035	-674	5080	-393

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	13	431	431	-34	212	246	325	-3224
37.50	21	423	423	-34	346	245	424	-3224
35.00	28	410	411	-34	481	244	540	-3224
33.00	34	397	399	-34	591	243	639	-3224
33.00	67	397	402	-97	1469	233	1487	-2803
30.00	75	341	349	-97	1632	232	1649	-2804
27.50	82	290	301	-97	1769	231	1784	-2805
25.00	89	235	251	-97	1905	230	1919	-2806
22.50	96	175	200	-97	2042	228	2055	-2806
20.00	103	112	152	-97	2180	227	2192	-2807
20.00	135	111	175	-161	3060	215	3068	-2387
17.50	141	18	142	-161	3198	214	3205	-2388
15.00	148	-81	168	-161	3336	211	3343	-2387
12.50	154	-183	239	-161	3475	209	3481	-2386
10.00	160	-289	330	-161	3613	207	3619	-2386
7.00	168	-422	454	-161	3780	204	3785	-2384
7.00	200	-423	468	-224	4661	189	4665	-1961
5.00	205	-536	574	-224	4771	188	4775	-1961
2.50	210	-681	713	-224	4910	184	4914	-1957
0.00	215	-831	858	-224	5050	180	5053	-1951

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	79	350	359	110	-50	-72	87	-436
37.50	76	349	358	110	88	-73	114	-436
35.00	74	345	353	110	225	-75	237	-436
33.00	72	338	346	110	334	-76	343	-436
33.00	79	332	341	98	1104	-85	1107	-19
30.00	76	289	299	98	1269	-87	1272	-19
27.50	73	249	259	98	1406	-88	1409	-20
25.00	70	204	216	98	1544	-90	1547	-21
22.50	68	156	170	98	1682	-91	1684	-21
20.00	65	104	122	98	1820	-93	1822	-21
20.00	71	97	120	86	2590	-101	2592	395
17.50	68	17	70	86	2728	-102	2730	394
15.00	65	-67	93	86	2866	-104	2868	394
12.50	62	-155	167	86	3004	-105	3006	394
10.00	59	-247	254	86	3142	-106	3143	395
7.00	55	-363	367	86	3307	-107	3308	396
7.00	61	-369	375	74	4076	-115	4078	816
5.00	59	-469	472	74	4186	-116	4188	816
2.50	55	-596	599	74	4322	-116	4324	823
0.00	52	-728	730	74	4460	-118	4461	823

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	52	359	363	-78	-26	33	42	-3024
37.50	53	358	362	-78	109	33	114	-3024
35.00	54	353	357	-78	245	32	247	-3024
33.00	55	345	350	-78	354	31	356	-3023
33.00	61	339	344	-90	1123	25	1123	-2606
30.00	62	295	302	-90	1286	23	1286	-2607
27.50	63	255	262	-90	1423	22	1423	-2607
25.00	64	210	219	-90	1559	21	1559	-2608
22.50	64	161	174	-90	1696	20	1697	-2609
20.00	65	108	126	-90	1834	19	1834	-2609
20.00	71	102	124	-102	2604	11	2604	-2193
17.50	71	22	75	-102	2742	10	2742	-2193
15.00	72	-63	95	-102	2880	8	2880	-2193
12.50	72	-151	168	-102	3018	6	3018	-2193
10.00	72	-244	254	-102	3156	4	3156	-2192
7.00	72	-361	368	-102	3323	2	3323	-2191
7.00	79	-367	375	-114	4094	-7	4094	-1772
5.00	78	-467	473	-114	4204	-9	4204	-1772
2.50	78	-595	600	-114	4343	-11	4343	-1769
0.00	78	-727	731	-114	4482	-14	4482	-1764

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.1	8.6	8.8	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.9	7.6	7.8	0.1	0.93	0.06	0.00	0.19	0.99	65.00	65.88
55.00	1.6	6.7	6.9	0.0	1.79	0.07	0.00	0.21	1.86	65.00	34.96
50.00	1.4	5.7	5.9	0.0	2.62	0.09	0.00	0.23	2.70	65.00	24.03
48.00	1.3	5.3	5.5	0.0	2.94	0.09	0.00	0.23	3.04	65.00	21.41
48.00	1.3	5.3	5.5	0.0	1.99	0.06	0.00	0.16	2.05	65.00	31.67
45.00	1.2	4.8	4.9	0.0	2.31	0.07	0.00	0.17	2.39	65.00	27.25
45.00	1.2	4.8	4.9	0.0	2.40	0.16	2.62	3.57	6.22	65.00	10.44
40.00	1.0	3.9	4.0	0.0	6.13	0.17	2.39	3.30	7.66	65.00	8.48
35.00	0.8	3.1	3.2	0.0	9.25	0.18	2.19	3.06	10.23	65.00	6.35
32.00	0.7	2.6	2.7	0.0	10.88	0.19	2.08	2.94	11.68	65.00	5.56
32.00	0.7	2.6	2.7	0.0	10.62	0.18	2.06	2.97	11.37	65.00	5.72
30.00	0.7	2.3	2.4	0.0	11.68	0.18	1.99	2.89	12.31	65.00	5.28
30.00	0.7	2.3	2.4	0.0	11.69	0.19	1.99	2.91	12.31	65.00	5.28
25.00	0.5	1.6	1.7	0.0	14.19	0.20	1.84	2.74	14.68	65.00	4.43
21.25	0.4	1.2	1.2	0.0	15.81	0.21	1.74	2.62	16.25	65.00	4.00
21.25	0.4	1.2	1.2	0.0	15.76	0.21	1.65	2.62	16.13	65.00	4.03
20.00	0.3	1.0	1.1	0.0	16.29	0.21	1.62	2.58	16.66	65.00	3.90
15.00	0.2	0.6	0.6	0.0	18.24	0.23	1.51	2.44	18.58	65.00	3.50
10.00	0.1	0.3	0.3	0.0	19.90	0.24	1.40	2.32	20.22	65.00	3.21
5.00	0.0	0.1	0.1	0.0	21.32	0.25	1.31	2.22	21.63	65.00	3.01
0.00	0.0	0.0	0.0	0.0	22.53	0.26	1.23	2.12	22.84	65.00	2.85

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	2.0	11.6	11.8	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.8	10.3	10.5	0.1	0.93	0.06	0.00	0.19	0.99	65.00	65.87
55.00	1.6	9.1	9.2	0.1	1.79	0.07	0.00	0.21	1.86	65.00	34.93
50.00	1.4	7.8	7.9	0.1	2.62	0.09	0.00	0.23	2.71	65.00	23.99
48.00	1.3	7.3	7.4	0.1	2.95	0.09	0.00	0.24	3.04	65.00	21.38
48.00	1.3	7.3	7.4	0.1	1.99	0.06	0.00	0.16	2.06	65.00	31.61
45.00	1.2	6.6	6.7	0.1	2.32	0.07	0.00	0.17	2.39	65.00	27.19
45.00	1.2	6.6	6.7	0.1	4.28	0.41	0.01	1.73	5.53	65.00	11.74
40.00	1.0	5.4	5.5	0.0	6.94	0.41	0.01	1.66	7.57	65.00	8.59
35.00	0.8	4.2	4.3	0.0	12.46	0.42	0.01	1.61	12.88	65.00	5.05
32.00	0.7	3.6	3.7	0.0	15.62	0.42	0.01	1.58	16.04	65.00	4.05
32.00	0.7	3.6	3.7	0.0	13.47	0.55	0.00	1.52	14.13	65.00	4.60
30.00	0.7	3.2	3.3	0.0	14.85	0.55	0.00	1.50	15.49	65.00	4.20
30.00	0.7	3.2	3.3	0.0	14.84	0.56	0.00	1.52	15.50	65.00	4.19
25.00	0.5	2.3	2.3	0.0	19.07	0.56	0.00	1.48	19.64	65.00	3.31
21.25	0.4	1.6	1.7	0.0	21.91	0.55	0.00	1.44	22.47	65.00	2.89
21.25	0.4	1.6	1.7	0.0	20.31	0.67	0.00	1.41	20.99	65.00	3.10
20.00	0.3	1.5	1.5	0.0	21.19	0.67	0.00	1.39	21.87	65.00	2.97
15.00	0.2	0.8	0.9	0.0	24.38	0.67	0.00	1.35	25.05	65.00	2.59
10.00	0.1	0.4	0.4	0.0	27.08	0.66	0.00	1.32	27.75	65.00	2.34
5.00	0.0	0.1	0.1	0.0	29.38	0.66	0.00	1.28	30.05	65.00	2.16
0.00	0.0	0.0	0.0	0.0	31.34	0.66	0.00	1.25	32.00	65.00	2.03

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.9	8.7	8.9	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.7	7.7	7.9	0.1	0.93	0.06	0.00	0.19	0.98	65.00	66.04
55.00	1.5	6.7	6.9	0.1	1.78	0.07	0.00	0.21	1.86	65.00	35.02
50.00	1.4	5.8	5.9	0.0	2.61	0.09	0.00	0.23	2.70	65.00	24.06
48.00	1.3	5.4	5.6	0.0	2.94	0.09	0.00	0.23	3.03	65.00	21.43
48.00	1.3	5.4	5.6	0.0	1.99	0.06	0.00	0.16	2.05	65.00	31.69
45.00	1.2	4.9	5.0	0.0	2.31	0.07	0.00	0.17	2.38	65.00	27.26
45.00	1.2	4.9	5.0	0.0	4.10	0.32	2.60	3.68	7.71	65.00	8.43
40.00	1.0	4.0	4.1	0.0	6.15	0.32	2.38	3.42	8.42	65.00	7.72
35.00	0.8	3.1	3.2	0.0	9.21	0.33	2.18	3.19	10.44	65.00	6.23
32.00	0.7	2.6	2.7	0.0	11.08	0.33	2.07	3.07	12.12	65.00	5.36
32.00	0.7	2.6	2.7	0.0	10.80	0.47	2.06	3.07	12.25	65.00	5.31
30.00	0.7	2.3	2.4	0.0	11.60	0.47	1.99	2.99	12.94	65.00	5.02
30.00	0.7	2.3	2.4	0.0	11.60	0.48	1.99	3.01	12.96	65.00	5.01
25.00	0.5	1.6	1.7	0.0	14.36	0.48	1.84	2.84	15.29	65.00	4.25
21.25	0.4	1.2	1.3	0.0	16.14	0.48	1.73	2.71	17.00	65.00	3.82
21.25	0.4	1.2	1.3	0.0	15.76	0.59	1.65	2.66	16.73	65.00	3.89
20.00	0.3	1.1	1.1	0.0	16.33	0.59	1.62	2.62	17.28	65.00	3.76
15.00	0.2	0.6	0.6	0.0	18.40	0.59	1.51	2.48	19.27	65.00	3.37
10.00	0.1	0.3	0.3	0.0	20.15	0.59	1.40	2.36	20.97	65.00	3.10
5.00	0.0	0.1	0.1	0.0	21.64	0.59	1.31	2.25	22.43	65.00	2.90
0.00	0.0	0.0	0.0	0.0	22.91	0.59	1.22	2.16	23.67	65.00	2.75

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.2	6.6	6.7	0.1	10.91	0.06	1.06	2.76	11.54	65.00	5.63
37.50	1.2	6.6	6.7	0.1	6.21	0.06	1.06	2.75	7.26	65.00	8.96
35.00	1.2	6.6	6.7	0.2	4.67	0.06	1.06	2.75	6.55	65.00	9.93
33.00	1.2	6.7	6.8	0.2	7.29	0.06	1.06	2.74	8.48	65.00	7.66
33.00	1.2	6.7	6.8	0.2	7.29	0.09	1.06	1.53	7.66	65.00	8.49
30.00	1.2	6.7	6.8	0.3	8.49	0.09	1.06	1.53	8.70	65.00	7.48
27.50	1.2	6.7	6.8	0.3	9.86	0.09	1.06	1.54	10.05	65.00	6.47
25.00	1.2	6.6	6.8	0.3	11.22	0.09	1.06	1.54	11.39	65.00	5.71
22.50	1.2	6.6	6.7	0.3	12.54	0.09	1.06	1.54	12.70	65.00	5.12
20.00	1.2	6.5	6.6	0.2	13.84	0.09	1.06	1.55	13.99	65.00	4.65
20.00	1.2	6.5	6.6	0.2	13.84	0.24	1.06	1.96	14.15	65.00	4.59
17.50	1.2	6.3	6.4	0.2	10.85	0.24	1.06	1.97	11.18	65.00	5.81
15.00	1.2	6.2	6.3	0.1	7.84	0.24	1.06	1.98	8.20	65.00	7.93
12.50	1.2	6.0	6.1	0.1	6.18	0.24	1.06	1.99	6.79	65.00	9.58
10.00	1.2	5.7	5.9	0.0	4.94	0.24	1.06	2.01	5.80	65.00	11.21
7.00	1.2	5.5	5.6	0.0	6.23	0.24	1.06	2.02	6.89	65.00	9.43
7.00	1.2	5.5	5.6	0.0	6.23	0.38	1.06	3.22	8.07	65.00	8.06
5.00	1.2	5.3	5.4	0.0	10.45	0.38	1.06	3.23	10.90	65.00	5.96
2.50	1.2	5.0	5.2	0.0	16.33	0.38	1.06	3.24	16.72	65.00	3.89
0.00	1.2	4.9	5.0	0.0	22.70	0.38	1.06	3.25	23.20	65.00	2.80

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	1.2	4.8	4.9	0.0	17.68	0.07	1.10	3.03	18.14	65.00	3.58
37.50	1.2	5.0	5.1	0.1	12.16	0.07	1.10	3.03	12.78	65.00	5.08
35.00	1.2	5.2	5.3	0.2	7.25	0.07	1.10	3.03	8.95	65.00	7.26
33.00	1.2	5.4	5.5	0.3	6.45	0.07	1.10	3.02	8.19	65.00	7.93
33.00	1.2	5.4	5.5	0.3	6.45	0.22	1.10	1.82	7.36	65.00	8.83
30.00	1.2	5.7	5.8	0.3	7.22	0.22	1.10	1.83	8.07	65.00	8.05
27.50	1.2	5.9	6.0	0.3	7.79	0.22	1.10	1.83	8.61	65.00	7.55
25.00	1.2	6.1	6.2	0.3	9.83	0.22	1.10	1.84	10.38	65.00	6.26
22.50	1.2	6.3	6.4	0.3	11.89	0.22	1.10	1.84	12.40	65.00	5.24
20.00	1.2	6.4	6.6	0.3	13.93	0.22	1.10	1.84	14.40	65.00	4.51
20.00	1.2	6.4	6.6	0.3	13.93	0.37	1.10	1.84	14.53	65.00	4.47
17.50	1.2	6.6	6.7	0.2	11.70	0.37	1.10	1.86	12.34	65.00	5.27
15.00	1.2	6.6	6.7	0.2	9.43	0.37	1.10	1.88	10.15	65.00	6.41
12.50	1.2	6.7	6.8	0.1	8.58	0.37	1.10	1.89	9.52	65.00	6.83
10.00	1.2	6.7	6.8	0.1	7.96	0.37	1.10	1.91	8.95	65.00	7.26
7.00	1.2	6.7	6.8	0.0	8.25	0.37	1.10	1.93	9.16	65.00	7.09
7.00	1.2	6.7	6.8	0.0	8.25	0.52	1.10	3.07	10.22	65.00	6.36
5.00	1.2	6.6	6.7	0.0	9.27	0.52	1.10	3.08	11.11	65.00	5.85
2.50	1.2	6.6	6.7	0.0	14.53	0.52	1.10	3.09	15.53	65.00	4.19
0.00	1.2	6.6	6.7	0.1	20.22	0.52	1.10	3.10	21.09	65.00	3.08

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	3.6	3.7	0.0	7.58	0.11	1.68	1.77	8.19	65.00	7.94
37.50	0.7	3.6	3.7	0.1	7.36	0.11	1.68	1.78	7.98	65.00	8.15
35.00	0.7	3.6	3.6	0.2	7.07	0.11	1.68	1.79	7.72	65.00	8.42
33.00	0.7	3.5	3.6	0.2	6.80	0.11	1.68	1.80	7.47	65.00	8.71
33.00	0.7	3.5	3.6	0.2	6.99	0.08	1.20	1.42	7.37	65.00	8.82
30.00	0.7	3.5	3.6	0.2	6.04	0.08	1.20	1.44	6.46	65.00	10.05
27.50	0.7	3.5	3.5	0.2	5.18	0.08	1.20	1.46	5.66	65.00	11.48
25.00	0.7	3.4	3.5	0.2	4.26	0.08	1.20	1.47	4.83	65.00	13.47
22.50	0.7	3.4	3.4	0.1	3.27	0.08	1.20	1.49	3.97	65.00	16.36
20.00	0.7	3.3	3.4	0.1	2.23	0.08	1.20	1.51	3.37	65.00	19.28
20.00	0.7	3.3	3.4	0.1	2.65	0.06	0.71	1.15	3.28	65.00	19.81
17.50	0.7	3.2	3.3	0.1	1.80	0.06	0.71	1.17	2.67	65.00	24.38
15.00	0.7	3.2	3.2	0.0	1.92	0.06	0.71	1.18	2.83	65.00	22.93
12.50	0.7	3.1	3.2	0.0	3.18	0.06	0.71	1.20	3.65	65.00	17.80
10.00	0.7	3.0	3.1	-0.1	4.62	0.06	0.71	1.22	4.98	65.00	13.06
7.00	0.7	2.9	3.0	-0.1	6.42	0.06	0.71	1.24	6.71	65.00	9.69
7.00	0.7	2.9	3.0	-0.1	6.62	0.03	0.23	0.88	6.72	65.00	9.67
5.00	0.7	2.8	2.9	-0.1	8.19	0.03	0.23	0.90	8.27	65.00	7.86
2.50	0.7	2.7	2.8	0.0	10.19	0.03	0.23	0.91	10.27	65.00	6.33
0.00	0.7	2.6	2.7	0.0	12.26	0.03	0.23	0.93	12.33	65.00	5.27

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	2.6	2.7	0.0	6.42	0.22	0.26	0.31	6.65	65.00	9.78
37.50	0.7	2.7	2.8	0.1	6.34	0.22	0.26	0.32	6.57	65.00	9.90
35.00	0.7	2.8	2.9	0.1	6.20	0.22	0.26	0.34	6.43	65.00	10.11
33.00	0.7	2.9	2.9	0.2	6.05	0.22	0.26	0.35	6.27	65.00	10.36
33.00	0.7	2.9	2.9	0.2	6.23	0.19	0.75	0.95	6.52	65.00	9.97
30.00	0.7	3.0	3.0	0.2	5.47	0.19	0.75	0.98	5.76	65.00	11.29
27.50	0.7	3.0	3.1	0.2	4.76	0.19	0.75	0.99	5.06	65.00	12.84
25.00	0.7	3.1	3.2	0.2	3.99	0.19	0.75	1.01	4.31	65.00	15.07
22.50	0.7	3.2	3.3	0.1	3.16	0.19	0.75	1.03	3.51	65.00	18.51
20.00	0.7	3.3	3.4	0.1	2.27	0.19	0.75	1.05	2.69	65.00	24.18
20.00	0.7	3.3	3.4	0.1	2.66	0.16	1.23	1.66	3.78	65.00	17.20
17.50	0.7	3.3	3.4	0.1	2.18	0.16	1.23	1.68	3.51	65.00	18.53
15.00	0.7	3.4	3.5	0.0	2.66	0.16	1.23	1.70	3.80	65.00	17.12
12.50	0.7	3.5	3.5	0.0	3.62	0.16	1.23	1.72	4.32	65.00	15.04
10.00	0.7	3.5	3.6	-0.1	5.22	0.16	1.23	1.74	5.69	65.00	11.42
7.00	0.7	3.5	3.6	-0.1	7.23	0.16	1.23	1.76	7.61	65.00	8.54
7.00	0.7	3.5	3.6	-0.1	7.43	0.13	1.72	2.37	8.04	65.00	8.09
5.00	0.7	3.6	3.6	-0.1	9.12	0.13	1.72	2.38	9.61	65.00	6.77
2.50	0.7	3.6	3.7	0.0	11.29	0.13	1.72	2.40	11.71	65.00	5.55
0.00	0.7	3.6	3.7	0.0	13.52	0.13	1.72	2.42	13.89	65.00	4.68

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	1.6	1.7	0.0	5.62	0.03	0.84	0.86	5.83	65.00	11.14
37.50	0.4	1.6	1.7	0.1	5.60	0.03	0.84	0.86	5.82	65.00	11.18
35.00	0.4	1.6	1.7	0.1	5.52	0.03	0.84	0.88	5.74	65.00	11.32
33.00	0.4	1.6	1.7	0.1	5.41	0.03	0.84	0.89	5.64	65.00	11.53
33.00	0.4	1.6	1.7	0.1	5.35	0.00	0.75	0.91	5.53	65.00	11.75
30.00	0.4	1.6	1.7	0.2	4.71	0.00	0.75	0.93	4.91	65.00	13.23
27.50	0.4	1.6	1.6	0.2	4.10	0.00	0.75	0.95	4.34	65.00	14.98
25.00	0.4	1.6	1.6	0.1	3.43	0.00	0.75	0.97	3.72	65.00	17.48
22.50	0.4	1.6	1.6	0.1	2.71	0.00	0.75	0.99	3.07	65.00	21.20
20.00	0.4	1.5	1.6	0.1	1.92	0.00	0.75	1.01	2.41	65.00	27.02
20.00	0.4	1.5	1.6	0.1	1.86	0.03	0.66	1.02	2.35	65.00	27.64
17.50	0.4	1.5	1.5	0.0	1.11	0.03	0.66	1.04	2.06	65.00	31.53
15.00	0.4	1.5	1.5	0.0	1.38	0.03	0.66	1.06	2.24	65.00	29.06
12.50	0.4	1.4	1.5	0.0	2.65	0.03	0.66	1.08	3.00	65.00	21.69
10.00	0.4	1.4	1.4	-0.1	3.99	0.03	0.66	1.10	4.22	65.00	15.40
7.00	0.4	1.3	1.4	-0.1	5.67	0.03	0.66	1.12	5.83	65.00	11.14
7.00	0.4	1.3	1.4	-0.1	5.81	0.06	0.57	1.14	5.92	65.00	10.99
5.00	0.4	1.3	1.4	-0.1	7.25	0.06	0.57	1.15	7.33	65.00	8.87
2.50	0.4	1.2	1.3	0.0	9.10	0.06	0.57	1.17	9.17	65.00	7.08
0.00	0.4	1.2	1.3	0.0	11.02	0.06	0.57	1.19	11.09	65.00	5.86

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	1.2	1.2	0.0	5.60	0.21	0.60	0.60	5.89	65.00	11.03
37.50	0.4	1.2	1.3	0.1	5.58	0.21	0.60	0.61	5.88	65.00	11.06
35.00	0.4	1.3	1.3	0.1	5.51	0.21	0.60	0.63	5.81	65.00	11.20
33.00	0.4	1.3	1.4	0.1	5.41	0.21	0.60	0.65	5.70	65.00	11.39
33.00	0.4	1.3	1.4	0.1	5.35	0.18	0.69	0.85	5.64	65.00	11.53
30.00	0.4	1.4	1.4	0.2	4.72	0.18	0.69	0.87	5.01	65.00	12.96
27.50	0.4	1.4	1.5	0.2	4.13	0.18	0.69	0.89	4.43	65.00	14.66
25.00	0.4	1.5	1.5	0.1	3.48	0.18	0.69	0.91	3.80	65.00	17.11
22.50	0.4	1.5	1.5	0.1	2.76	0.18	0.69	0.93	3.11	65.00	20.87
20.00	0.4	1.5	1.6	0.1	1.99	0.18	0.69	0.95	2.39	65.00	27.18
20.00	0.4	1.5	1.6	0.1	1.93	0.15	0.78	1.14	2.46	65.00	26.46
17.50	0.4	1.6	1.6	0.1	1.18	0.15	0.78	1.16	2.22	65.00	29.23
15.00	0.4	1.6	1.6	0.0	1.44	0.15	0.78	1.18	2.37	65.00	27.40
12.50	0.4	1.6	1.6	0.0	2.66	0.15	0.78	1.20	3.01	65.00	21.60
10.00	0.4	1.6	1.7	-0.1	4.02	0.15	0.78	1.22	4.31	65.00	15.09
7.00	0.4	1.6	1.7	-0.1	5.74	0.15	0.78	1.24	5.98	65.00	10.87
7.00	0.4	1.6	1.7	-0.1	5.87	0.12	0.87	1.44	6.10	65.00	10.65
5.00	0.4	1.6	1.7	-0.1	7.34	0.12	0.87	1.46	7.54	65.00	8.62
2.50	0.4	1.6	1.7	0.0	9.22	0.12	0.87	1.48	9.41	65.00	6.91
0.00	0.4	1.6	1.7	0.0	11.16	0.12	0.87	1.50	11.34	65.00	5.73

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	512	1493	1579	704
60.00	106	-31	110	0	515	1881	1951	1041
55.00	231	-62	239	0	518	2290	2348	1397
50.00	382	-93	393	0	522	2720	2769	1771
48.00	449	-106	461	0	523	2898	2945	1926
48.00	449	-106	461	0	523	2897	2944	1926
45.00	558	-124	572	0	526	3173	3216	2281
45.00	731	-189	755	1260	667	18750	18762	6036
40.00	1870	-229	1884	1260	651	19220	19231	6671
35.00	3038	-268	3050	1260	639	19708	19718	7336
32.00	3753	-291	3764	1260	641	20016	20026	7734
32.00	3817	-157	3820	1386	2666	22521	22678	8760
30.00	4360	-221	4366	1386	2667	22730	22886	9030
30.00	4372	-221	4378	1386	2656	23528	23678	9273
25.00	5800	-379	5812	1386	2642	24046	24190	10021
21.25	6891	-498	6909	1386	2643	24461	24604	10561
21.25	6987	-418	6999	1462	4233	26507	26842	11728
20.00	7385	-481	7401	1462	4220	26627	26960	11961
15.00	9000	-733	9030	1462	4201	27166	27489	12797
10.00	10648	-984	10694	1462	4182	27718	28032	13669
5.00	12330	-1233	12391	1462	4163	28283	28588	14575
0.00	14046	-1483	14124	1462	4164	28913	29211	15410

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	501	1501	1583	695
60.00	107	-30	111	0	502	1891	1957	1032
55.00	232	-60	240	0	502	2302	2356	1388
50.00	383	-90	394	0	503	2734	2780	1762
48.00	451	-102	463	0	503	2913	2956	1916
48.00	451	-102	463	0	503	2913	2956	1917
45.00	561	-121	574	0	503	3190	3230	2271
45.00	217	540	582	-2	7149	29766	30612	12955
40.00	2018	111	2021	-2	7151	30229	31063	13605
35.00	3846	-318	3860	-2	7150	30708	31529	14294
32.00	4957	-575	4991	-2	7151	31018	31832	14691
32.00	4450	76	4451	-5	6393	34024	34619	19510
30.00	5269	-77	5270	-5	6393	34235	34826	19781
30.00	5281	-77	5282	-5	6392	35009	35587	20049
25.00	7398	-461	7412	-5	6390	35493	36063	20842
21.25	9005	-748	9036	-5	6391	35911	36475	21383
21.25	8704	-232	8707	-7	5320	39925	40278	25909
20.00	9304	-312	9309	-7	5318	40005	40357	26187
15.00	11722	-631	11739	-7	5313	40475	40822	27102
10.00	14168	-949	14200	-7	5305	40950	41292	28062
5.00	16643	-1268	16692	-7	5296	41430	41767	29063
0.00	19148	-1586	19214	-7	5296	42061	42393	29898

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	491	1500	1579	705
60.00	106	-29	110	0	489	1888	1950	1041
55.00	232	-59	239	0	486	2297	2348	1397
50.00	383	-88	393	0	484	2727	2769	1771
48.00	450	-99	461	0	483	2905	2944	1926
48.00	450	-99	461	0	483	2904	2944	1927
45.00	560	-117	572	0	481	3180	3216	2281
45.00	731	628	964	-1266	6928	18789	20026	8817
40.00	1873	212	1885	-1266	6947	19248	20463	9451
35.00	3043	-205	3050	-1266	6959	19727	20919	10116
32.00	3758	-456	3786	-1266	6959	20035	21209	10514
32.00	3822	65	3822	-1393	5703	22537	23247	14265
30.00	4365	-72	4366	-1393	5703	22746	23450	14536
30.00	4377	-73	4378	-1393	5713	23531	24215	14778
25.00	5805	-416	5820	-1393	5726	24031	24704	15527
21.25	6896	-674	6929	-1393	5726	24446	25108	16067
21.25	6991	-233	6995	-1470	5213	26482	26990	19399
20.00	7389	-311	7396	-1470	5223	26585	27093	19632
15.00	9002	-626	9023	-1470	5236	27094	27595	20468
10.00	10645	-942	10686	-1470	5245	27615	28109	21340
5.00	12320	-1258	12384	-1470	5253	28149	28635	22245
0.00	14028	-1573	14116	-1470	5253	28779	29254	23080

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-701	-137	714	171	-3949	13284	13859	-94
37.50	-306	-20	306	171	-3822	13067	13614	-101
35.00	83	93	124	171	-3691	12851	13371	-101
33.00	389	180	429	171	-3590	12677	13176	-99
33.00	389	180	429	171	-825	4198	4279	2115
30.00	536	207	574	171	-668	3937	3994	2119
27.50	651	225	689	171	-537	3719	3758	2124
25.00	759	239	796	171	-405	3501	3524	2128
22.50	861	250	896	171	-274	3282	3293	2133
20.00	956	256	990	171	-141	3067	3070	2133
20.00	956	256	990	171	2648	-5422	6035	4284
17.50	790	174	809	171	2781	-5638	6286	4284
15.00	618	89	624	171	2916	-5858	6544	4275
12.50	439	0	439	171	3054	-6078	6803	4264
10.00	253	-94	270	171	3188	-6294	7056	4262
7.00	22	-212	213	171	3348	-6552	7358	4262
7.00	22	-212	213	171	6155	-15039	16250	6379
5.00	-341	-361	497	171	6261	-15211	16449	6379
2.50	-801	-551	972	171	6396	-15409	16684	6418
0.00	-1266	-745	1469	171	6529	-15624	16933	6418

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1260	-65	1262	-172	-3743	15580	16023	-165
37.50	-796	46	798	-172	-3611	15365	15783	-165
35.00	-339	152	371	-172	-3472	15151	15544	-185
33.00	23	234	235	-172	-3360	14980	15352	-193
33.00	23	234	235	-172	-555	6535	6558	2093
30.00	254	251	357	-172	-393	6276	6288	2096
27.50	439	261	510	-172	-257	6059	6065	2101
25.00	617	266	672	-172	-121	5842	5843	2107
22.50	789	268	834	-172	14	5624	5624	2115
20.00	955	266	991	-172	147	5408	5410	2115
20.00	955	265	991	-172	2937	-3059	4240	4358
17.50	860	175	878	-172	3069	-3274	4488	4358
15.00	758	81	763	-172	3201	-3497	4741	4352
12.50	650	-17	650	-172	3331	-3725	4997	4343
10.00	535	-119	548	-172	3463	-3941	5246	4343
7.00	388	-246	460	-172	3618	-4205	5548	4340
7.00	388	-246	460	-172	6385	-12691	14206	6529
5.00	82	-401	409	-172	6491	-12863	14408	6529
2.50	-308	-597	672	-172	6602	-13081	14652	6546
0.00	-703	-797	1063	-172	6733	-13297	14904	6546

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	117	124	171	254	-1028	1504	1822	-1269
37.50	159	153	221	254	-897	1289	1570	-1268
35.00	195	178	264	254	-765	1074	1318	-1268
33.00	218	195	293	254	-659	902	1117	-1268
33.00	218	195	293	190	216	702	735	-1267
30.00	239	185	302	190	375	444	582	-1267
27.50	249	172	302	190	507	230	557	-1267
25.00	253	154	296	190	640	16	640	-1267
22.50	250	133	283	190	773	-198	798	-1267
20.00	241	108	264	190	906	-412	995	-1267
20.00	241	108	264	127	1782	-609	1883	-1269
17.50	219	53	226	127	1915	-822	2084	-1269
15.00	191	-7	192	127	2048	-1037	2296	-1270
12.50	157	-70	172	127	2182	-1250	2515	-1270
10.00	116	-138	180	127	2316	-1464	2740	-1270
7.00	59	-224	231	127	2477	-1721	3016	-1270
7.00	59	-224	231	63	3354	-1917	3863	-1270
5.00	11	-305	305	63	3461	-2088	4042	-1270
2.50	-55	-411	415	63	3595	-2302	4269	-1269
0.00	-127	-521	536	63	3730	-2516	4500	-1266

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-125	133	183	-64	-1006	2512	2706	-2035
37.50	-53	161	170	-64	-872	2297	2457	-2035
35.00	13	185	186	-64	-739	2083	2210	-2034
33.00	61	202	211	-64	-633	1911	2013	-2034
33.00	61	202	210	-127	244	1715	1732	-2033
30.00	118	190	223	-127	404	1458	1513	-2032
27.50	158	176	237	-127	537	1243	1354	-2032
25.00	192	158	249	-127	670	1029	1228	-2032
22.50	220	136	258	-127	803	815	1144	-2032
20.00	241	109	265	-127	936	600	1112	-2032
20.00	241	109	265	-190	1812	403	1856	-2032
17.50	250	53	256	-190	1945	188	1954	-2032
15.00	253	-7	253	-190	2078	-26	2078	-2032
12.50	249	-72	259	-190	2211	-242	2224	-2032
10.00	238	-140	276	-190	2344	-457	2388	-2032
7.00	217	-227	314	-190	2504	-715	2604	-2032
7.00	217	-228	314	-254	3380	-915	3501	-2031
5.00	193	-310	365	-254	3486	-1088	3652	-2030
2.50	157	-417	445	-254	3620	-1305	3848	-2028
0.00	115	-527	539	-254	3752	-1520	4048	-2028

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-66	72	98	150	-1150	2022	2326	-525
37.50	-9	104	105	150	-1017	1807	2073	-524
35.00	42	133	139	150	-883	1593	1821	-524
33.00	78	153	172	150	-776	1421	1619	-524
33.00	78	153	172	132	-10	1199	1199	-523
30.00	117	150	190	132	150	942	954	-523
27.50	142	144	202	132	284	728	782	-523
25.00	161	133	209	132	418	514	662	-523
22.50	173	119	210	132	552	300	628	-523
20.00	179	100	205	132	686	86	691	-523
20.00	179	100	205	113	1452	-134	1458	-524
17.50	171	55	180	113	1587	-347	1624	-524
15.00	158	5	158	113	1721	-561	1810	-524
12.50	138	-49	146	113	1856	-775	2011	-524
10.00	111	-106	154	113	1991	-987	2222	-524
7.00	71	-181	194	113	2152	-1244	2486	-524
7.00	71	-181	194	95	2919	-1463	3266	-525
5.00	34	-252	254	95	3027	-1634	3440	-525
2.50	-18	-345	346	95	3162	-1847	3662	-523
0.00	-77	-442	449	95	3298	-2061	3889	-521

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-76	79	110	-95	-1133	2059	2350	-1599
37.50	-17	111	113	-95	-999	1845	2098	-1599
35.00	35	139	143	-95	-864	1632	1846	-1599
33.00	72	159	174	-95	-756	1460	1645	-1599
33.00	72	159	174	-114	10	1241	1241	-1597
30.00	112	155	191	-114	172	984	999	-1597
27.50	138	148	203	-114	306	771	829	-1597
25.00	158	137	209	-114	440	557	710	-1597
22.50	172	122	211	-114	574	344	669	-1597
20.00	179	102	206	-114	709	130	720	-1597
20.00	179	102	206	-132	1475	-91	1478	-1597
17.50	173	56	182	-132	1609	-305	1638	-1597
15.00	161	6	161	-132	1743	-519	1819	-1598
12.50	142	-49	150	-132	1877	-734	2015	-1598
10.00	117	-107	158	-132	2011	-948	2223	-1598
7.00	78	-182	198	-132	2172	-1205	2484	-1598
7.00	78	-182	198	-150	2938	-1428	3267	-1598
5.00	41	-254	257	-150	3046	-1600	3440	-1597
2.50	-10	-347	347	-150	3180	-1815	3661	-1595
0.00	-67	-445	450	-150	3313	-2030	3886	-1595

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	12.7	12.7	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	1.0	11.3	11.3	0.1	1.06	0.06	0.00	0.21	1.12	65.00	58.05
55.00	0.8	9.9	9.9	0.1	2.08	0.07	0.00	0.24	2.15	65.00	30.27
50.00	0.7	8.5	8.6	0.1	3.08	0.09	0.00	0.27	3.17	65.00	20.52
48.00	0.7	8.0	8.0	0.1	3.48	0.09	0.00	0.28	3.57	65.00	18.19
48.00	0.7	8.0	8.0	0.1	2.35	0.06	0.00	0.19	2.42	65.00	26.90
45.00	0.6	7.2	7.2	0.1	2.76	0.07	0.00	0.20	2.83	65.00	22.98
45.00	0.6	7.2	7.2	0.1	3.64	0.19	2.97	4.15	7.37	65.00	8.82
40.00	0.5	5.9	5.9	0.1	8.22	0.20	2.71	3.87	9.87	65.00	6.59
35.00	0.4	4.6	4.7	0.0	12.13	0.21	2.48	3.62	13.22	65.00	4.92
32.00	0.4	3.9	4.0	0.0	14.20	0.22	2.36	3.49	15.11	65.00	4.30
32.00	0.4	3.9	4.0	0.0	14.31	0.24	2.60	3.87	15.33	65.00	4.24
30.00	0.3	3.5	3.5	0.0	15.85	0.25	2.51	3.77	16.76	65.00	3.88
30.00	0.3	3.5	3.5	0.0	15.89	0.25	2.51	3.82	16.82	65.00	3.87
25.00	0.2	2.5	2.5	0.0	19.53	0.26	2.32	3.60	20.27	65.00	3.21
21.25	0.2	1.8	1.8	0.0	21.94	0.27	2.19	3.46	22.59	65.00	2.88
21.25	0.2	1.8	1.8	0.0	22.17	0.30	2.31	3.69	22.87	65.00	2.84
20.00	0.2	1.6	1.6	0.0	23.02	0.30	2.27	3.64	23.70	65.00	2.74
15.00	0.1	0.9	0.9	0.0	26.16	0.31	2.11	3.46	26.76	65.00	2.43
10.00	0.0	0.4	0.4	0.0	28.90	0.32	1.96	3.29	29.45	65.00	2.21
5.00	0.0	0.1	0.1	0.0	31.29	0.33	1.83	3.14	31.80	65.00	2.04
0.00	0.0	0.0	0.0	0.0	33.38	0.34	1.71	3.01	33.88	65.00	1.92

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	16.4	16.4	0.2	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	0.9	14.6	14.7	0.2	1.07	0.06	0.00	0.21	1.12	65.00	57.92
55.00	0.8	12.9	12.9	0.2	2.08	0.07	0.00	0.24	2.15	65.00	30.19
50.00	0.7	11.1	11.2	0.1	3.09	0.09	0.00	0.27	3.18	65.00	20.46
48.00	0.7	10.4	10.5	0.1	3.49	0.09	0.00	0.29	3.58	65.00	18.13
48.00	0.7	10.4	10.5	0.1	2.36	0.06	0.00	0.19	2.42	65.00	26.82
45.00	0.6	9.4	9.4	0.1	2.77	0.07	0.00	0.20	2.84	65.00	22.91
45.00	0.6	9.4	9.4	0.1	2.79	0.40	0.01	1.94	4.63	65.00	14.03
40.00	0.5	7.7	7.8	0.1	8.71	0.41	0.01	1.88	9.25	65.00	7.03
35.00	0.4	6.1	6.1	0.1	15.33	0.41	0.00	1.83	15.74	65.00	4.13
32.00	0.4	5.2	5.2	0.1	18.95	0.41	0.00	1.80	19.36	65.00	3.36
32.00	0.4	5.2	5.2	0.1	16.57	0.54	0.01	1.96	17.18	65.00	3.78
30.00	0.3	4.6	4.7	0.0	18.97	0.54	0.01	1.94	19.52	65.00	3.33
30.00	0.3	4.6	4.7	0.0	19.02	0.55	0.01	1.98	19.57	65.00	3.32
25.00	0.2	3.3	3.3	0.0	24.90	0.55	0.01	1.92	25.45	65.00	2.55
21.25	0.2	2.4	2.4	0.0	28.75	0.55	0.01	1.89	29.30	65.00	2.22
21.25	0.2	2.4	2.4	0.0	27.38	0.66	0.01	2.08	28.04	65.00	2.32
20.00	0.2	2.2	2.2	0.0	28.76	0.66	0.01	2.06	29.43	65.00	2.21
15.00	0.1	1.3	1.3	0.0	33.83	0.66	0.01	2.01	34.49	65.00	1.88
10.00	0.0	0.6	0.6	0.0	38.19	0.66	0.01	1.96	38.86	65.00	1.67
5.00	0.0	0.1	0.1	0.0	41.97	0.66	0.01	1.92	42.63	65.00	1.52
0.00	0.0	0.0	0.0	0.0	45.24	0.66	0.01	1.88	45.90	65.00	1.42

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	12.7	12.7	0.1	0.05	0.04	0.00	0.18	0.32	65.00	99.90
60.00	0.8	11.3	11.3	0.1	1.06	0.06	0.00	0.21	1.12	65.00	58.04
55.00	0.8	9.9	9.9	0.1	2.07	0.07	0.00	0.24	2.15	65.00	30.28
50.00	0.7	8.5	8.5	0.1	3.08	0.09	0.00	0.27	3.17	65.00	20.53
48.00	0.6	8.0	8.0	0.1	3.48	0.09	0.00	0.28	3.57	65.00	18.20
48.00	0.6	8.0	8.0	0.1	2.35	0.06	0.00	0.19	2.42	65.00	26.91
45.00	0.6	7.2	7.2	0.1	2.76	0.07	0.00	0.20	2.83	65.00	22.99
45.00	0.6	7.2	7.2	0.1	4.64	0.28	2.98	4.24	8.68	65.00	7.49
40.00	0.5	5.9	5.9	0.1	8.21	0.28	2.72	3.95	10.36	65.00	6.27
35.00	0.4	4.6	4.6	0.0	12.08	0.29	2.50	3.70	13.16	65.00	4.94
32.00	0.4	3.9	4.0	0.0	14.39	0.29	2.37	3.57	15.28	65.00	4.25
32.00	0.4	3.9	4.0	0.0	14.23	0.40	2.61	3.92	15.68	65.00	4.15
30.00	0.3	3.5	3.5	0.0	15.73	0.40	2.53	3.83	16.90	65.00	3.85
30.00	0.3	3.5	3.5	0.0	15.77	0.41	2.53	3.87	16.95	65.00	3.83
25.00	0.2	2.5	2.5	0.0	19.58	0.41	2.33	3.65	20.39	65.00	3.19
21.25	0.2	1.8	1.8	0.0	22.10	0.41	2.20	3.50	22.82	65.00	2.85
21.25	0.2	1.8	1.8	0.0	22.03	0.50	2.32	3.72	22.85	65.00	2.84
20.00	0.2	1.6	1.6	0.0	22.90	0.50	2.28	3.67	23.70	65.00	2.74
15.00	0.1	0.9	0.9	0.0	26.08	0.50	2.12	3.48	26.81	65.00	2.42
10.00	0.0	0.4	0.4	0.0	28.86	0.50	1.97	3.31	29.54	65.00	2.20
5.00	0.0	0.1	0.1	0.0	31.28	0.51	1.84	3.16	31.93	65.00	2.04
0.00	0.0	0.0	0.0	0.0	33.40	0.51	1.72	3.02	34.02	65.00	1.91

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	9.4	9.4	0.1	11.13	0.01	1.31	3.24	11.43	65.00	5.69
37.50	0.6	9.4	9.5	0.2	4.62	0.01	1.31	3.20	6.16	65.00	10.56
35.00	0.6	9.5	9.5	0.2	1.87	0.01	1.31	3.17	5.60	65.00	11.60
33.00	0.6	9.5	9.5	0.2	6.82	0.01	1.31	3.14	7.32	65.00	8.88
33.00	0.6	9.5	9.5	0.2	6.82	0.14	1.31	1.91	7.27	65.00	8.95
30.00	0.6	9.5	9.5	0.3	9.14	0.14	1.31	1.87	9.51	65.00	6.84
27.50	0.6	9.5	9.5	0.3	10.94	0.14	1.31	1.84	11.27	65.00	5.77
25.00	0.6	9.4	9.4	0.3	12.61	0.14	1.31	1.80	12.92	65.00	5.03
22.50	0.6	9.3	9.3	0.3	14.17	0.15	1.31	1.77	14.46	65.00	4.49
20.00	0.6	9.2	9.2	0.3	15.61	0.15	1.31	1.74	15.89	65.00	4.09
20.00	0.6	9.2	9.2	0.3	15.61	0.29	1.31	2.15	16.05	65.00	4.05
17.50	0.6	9.0	9.0	0.3	12.68	0.29	1.31	2.19	13.15	65.00	4.94
15.00	0.6	8.8	8.8	0.2	9.62	0.29	1.31	2.22	10.14	65.00	6.41
12.50	0.6	8.5	8.6	0.2	6.45	0.29	1.31	2.26	7.09	65.00	9.17
10.00	0.6	8.3	8.3	0.1	4.29	0.29	1.31	2.29	5.36	65.00	12.13
7.00	0.6	7.9	7.9	0.1	3.24	0.29	1.31	2.33	5.01	65.00	12.98
7.00	0.6	7.9	7.9	0.1	3.24	0.43	1.31	3.58	6.80	65.00	9.56
5.00	0.6	7.7	7.7	0.1	7.38	0.43	1.31	3.60	8.61	65.00	7.55
2.50	0.6	7.4	7.4	0.1	15.12	0.44	1.31	3.64	15.72	65.00	4.13
0.00	0.6	7.2	7.2	0.1	23.14	0.44	1.31	3.67	23.69	65.00	2.74

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	7.2	7.2	0.1	18.92	0.01	1.32	3.55	19.15	65.00	3.39
37.50	0.6	7.4	7.4	0.1	11.98	0.01	1.32	3.52	12.79	65.00	5.08
35.00	0.6	7.7	7.7	0.2	5.90	0.01	1.32	3.49	7.47	65.00	8.70
33.00	0.6	7.9	7.9	0.2	3.58	0.01	1.32	3.46	6.87	65.00	9.46
33.00	0.6	7.9	7.9	0.2	3.58	0.14	1.32	2.23	5.28	65.00	12.32
30.00	0.6	8.3	8.3	0.3	5.26	0.14	1.32	2.20	6.50	65.00	10.00
27.50	0.6	8.5	8.6	0.3	8.04	0.14	1.32	2.17	8.64	65.00	7.52
25.00	0.6	8.8	8.8	0.3	10.70	0.14	1.32	2.14	11.20	65.00	5.81
22.50	0.6	9.0	9.0	0.3	13.24	0.14	1.32	2.11	13.67	65.00	4.75
20.00	0.6	9.2	9.2	0.3	15.65	0.14	1.32	2.08	16.05	65.00	4.05
20.00	0.6	9.2	9.2	0.3	15.65	0.30	1.32	1.91	16.17	65.00	4.02
17.50	0.6	9.3	9.3	0.3	13.71	0.30	1.32	1.95	14.26	65.00	4.56
15.00	0.6	9.4	9.4	0.2	11.64	0.30	1.32	1.98	12.23	65.00	5.31
12.50	0.6	9.5	9.5	0.2	9.66	0.30	1.32	2.02	10.51	65.00	6.18
10.00	0.6	9.5	9.5	0.2	8.59	0.30	1.32	2.05	9.52	65.00	6.83
7.00	0.6	9.5	9.5	0.1	7.21	0.30	1.32	2.09	8.27	65.00	7.86
7.00	0.6	9.5	9.5	0.1	7.21	0.44	1.32	3.29	9.08	65.00	7.16
5.00	0.6	9.5	9.5	0.1	6.39	0.44	1.32	3.32	8.93	65.00	7.28
2.50	0.6	9.4	9.5	0.1	10.65	0.45	1.32	3.36	12.01	65.00	5.41
0.00	0.6	9.4	9.4	0.1	16.00	0.45	1.32	3.39	17.09	65.00	3.80

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	5.2	5.2	0.1	2.54	0.09	1.94	2.20	4.46	65.00	14.57
37.50	0.4	5.2	5.2	0.1	3.27	0.09	1.94	2.16	4.87	65.00	13.36
35.00	0.4	5.2	5.2	0.1	3.95	0.09	1.94	2.13	5.26	65.00	12.37
33.00	0.4	5.2	5.2	0.1	4.40	0.09	1.94	2.10	5.57	65.00	11.67
33.00	0.4	5.2	5.2	0.1	4.40	0.09	1.46	1.56	5.20	65.00	12.49
30.00	0.4	5.2	5.2	0.2	4.64	0.09	1.46	1.54	5.42	65.00	12.00
27.50	0.4	5.1	5.1	0.2	4.71	0.09	1.46	1.53	5.48	65.00	11.86
25.00	0.4	5.0	5.1	0.2	4.66	0.09	1.46	1.55	5.44	65.00	11.95
22.50	0.4	5.0	5.0	0.1	4.49	0.09	1.46	1.57	5.30	65.00	12.27
20.00	0.4	4.9	4.9	0.1	4.20	0.09	1.46	1.60	5.06	65.00	12.85
20.00	0.4	4.9	4.9	0.1	4.20	0.09	0.97	1.23	4.74	65.00	13.71
17.50	0.4	4.8	4.8	0.1	3.55	0.09	0.97	1.26	4.16	65.00	15.61
15.00	0.4	4.7	4.7	0.1	2.85	0.09	0.97	1.29	3.69	65.00	17.60
12.50	0.4	4.6	4.6	0.0	2.74	0.09	0.97	1.32	3.63	65.00	17.90
10.00	0.4	4.5	4.5	0.0	2.73	0.09	0.97	1.35	3.59	65.00	18.09
7.00	0.4	4.3	4.3	0.0	3.65	0.09	0.97	1.39	4.38	65.00	14.82
7.00	0.4	4.3	4.3	0.0	3.65	0.09	0.49	1.02	4.05	65.00	16.04
5.00	0.4	4.2	4.2	0.0	4.55	0.09	0.49	1.05	4.92	65.00	13.22
2.50	0.4	4.1	4.1	0.0	6.38	0.09	0.49	1.08	6.54	65.00	9.93
0.00	0.4	3.9	4.0	0.0	8.43	0.09	0.49	1.11	8.58	65.00	7.57

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	3.9	4.0	0.0	2.72	0.14	0.49	0.87	2.98	65.00	21.79
37.50	0.4	4.1	4.1	0.1	2.69	0.14	0.49	0.83	2.93	65.00	22.17
35.00	0.4	4.2	4.2	0.1	2.80	0.14	0.49	0.80	2.97	65.00	21.85
33.00	0.4	4.3	4.3	0.1	3.34	0.14	0.49	0.77	3.51	65.00	18.53
33.00	0.4	4.3	4.3	0.1	3.33	0.14	0.97	1.22	3.82	65.00	17.02
30.00	0.4	4.5	4.5	0.2	3.51	0.14	0.97	1.18	3.94	65.00	16.48
27.50	0.4	4.6	4.6	0.2	3.55	0.14	0.97	1.16	3.96	65.00	16.41
25.00	0.4	4.7	4.7	0.2	3.79	0.14	0.97	1.15	4.18	65.00	15.54
22.50	0.4	4.8	4.8	0.1	4.06	0.14	0.97	1.13	4.44	65.00	14.65
20.00	0.4	4.9	4.9	0.1	4.21	0.14	0.97	1.13	4.58	65.00	14.20
20.00	0.4	4.9	4.9	0.1	4.21	0.14	1.46	1.72	5.04	65.00	12.89
17.50	0.4	5.0	5.0	0.1	4.00	0.14	1.46	1.73	4.88	65.00	13.33
15.00	0.4	5.1	5.1	0.1	3.76	0.14	1.46	1.75	4.70	65.00	13.84
12.50	0.4	5.1	5.1	0.1	4.09	0.14	1.46	1.77	4.99	65.00	13.03
10.00	0.4	5.2	5.2	0.0	4.35	0.14	1.46	1.79	5.23	65.00	12.43
7.00	0.4	5.2	5.2	0.0	4.66	0.14	1.46	1.82	5.45	65.00	11.94
7.00	0.4	5.2	5.2	0.0	4.67	0.14	1.95	2.43	6.11	65.00	10.63
5.00	0.4	5.2	5.2	0.0	5.73	0.14	1.95	2.45	6.84	65.00	9.51
2.50	0.4	5.2	5.2	0.0	7.08	0.14	1.95	2.48	8.01	65.00	8.12
0.00	0.4	5.2	5.2	0.1	8.45	0.14	1.95	2.51	9.24	65.00	7.03

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.4	2.4	0.0	1.46	0.04	1.15	1.48	2.96	65.00	21.98
37.50	0.2	2.4	2.4	0.1	1.59	0.04	1.15	1.44	2.97	65.00	21.87
35.00	0.2	2.4	2.4	0.1	2.21	0.04	1.15	1.40	3.19	65.00	20.37
33.00	0.2	2.4	2.4	0.1	2.72	0.04	1.15	1.38	3.55	65.00	18.30
33.00	0.2	2.4	2.4	0.1	2.72	0.04	1.01	1.18	3.42	65.00	19.02
30.00	0.2	2.4	2.4	0.1	2.92	0.04	1.01	1.14	3.55	65.00	18.29
27.50	0.2	2.4	2.4	0.1	2.98	0.04	1.01	1.12	3.58	65.00	18.14
25.00	0.2	2.4	2.4	0.1	3.17	0.04	1.01	1.10	3.72	65.00	17.46
22.50	0.2	2.4	2.4	0.1	3.26	0.04	1.01	1.10	3.81	65.00	17.07
20.00	0.2	2.3	2.4	0.1	3.24	0.04	1.01	1.11	3.79	65.00	17.16
20.00	0.2	2.3	2.4	0.1	3.24	0.04	0.87	1.07	3.74	65.00	17.37
17.50	0.2	2.3	2.3	0.1	2.85	0.04	0.87	1.10	3.42	65.00	19.02
15.00	0.2	2.3	2.3	0.1	2.35	0.04	0.87	1.12	3.04	65.00	21.38
12.50	0.2	2.2	2.2	0.0	2.32	0.04	0.87	1.15	3.09	65.00	21.07
10.00	0.2	2.1	2.1	0.0	2.28	0.04	0.87	1.18	3.09	65.00	21.04
7.00	0.2	2.0	2.0	0.0	3.09	0.04	0.87	1.22	3.70	65.00	17.55
7.00	0.2	2.0	2.0	0.0	3.09	0.04	0.73	1.18	3.64	65.00	17.87
5.00	0.2	2.0	2.0	0.0	3.91	0.04	0.73	1.21	4.39	65.00	14.82
2.50	0.2	1.9	1.9	0.0	5.18	0.04	0.73	1.24	5.40	65.00	12.04
0.00	0.2	1.8	1.8	0.0	6.96	0.04	0.73	1.27	7.14	65.00	9.10

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC1 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.8	1.8	0.0	1.63	0.11	0.73	1.06	2.37	65.00	27.37
37.50	0.2	1.9	1.9	0.0	1.74	0.11	0.73	1.02	2.40	65.00	27.03
35.00	0.2	2.0	2.0	0.1	2.26	0.11	0.73	0.99	2.65	65.00	24.55
33.00	0.2	2.0	2.0	0.1	2.77	0.11	0.73	0.96	3.06	65.00	21.22
33.00	0.2	2.0	2.0	0.1	2.77	0.11	0.87	1.04	3.20	65.00	20.29
30.00	0.2	2.1	2.1	0.1	2.96	0.11	0.87	1.01	3.35	65.00	19.43
27.50	0.2	2.2	2.2	0.1	3.02	0.11	0.87	0.99	3.39	65.00	19.17
25.00	0.2	2.3	2.3	0.1	3.16	0.11	0.87	0.97	3.54	65.00	18.37
22.50	0.2	2.3	2.3	0.1	3.27	0.11	0.87	0.96	3.63	65.00	17.89
20.00	0.2	2.3	2.4	0.1	3.25	0.11	0.87	0.97	3.62	65.00	17.97
20.00	0.2	2.3	2.4	0.1	3.25	0.11	1.01	1.22	3.77	65.00	17.26
17.50	0.2	2.4	2.4	0.1	2.88	0.11	1.01	1.24	3.47	65.00	18.74
15.00	0.2	2.4	2.4	0.1	2.40	0.11	1.01	1.26	3.13	65.00	20.77
12.50	0.2	2.4	2.4	0.0	2.38	0.11	1.01	1.29	3.19	65.00	20.39
10.00	0.2	2.4	2.4	0.0	2.36	0.11	1.01	1.32	3.21	65.00	20.24
7.00	0.2	2.4	2.5	0.0	3.15	0.11	1.01	1.36	3.77	65.00	17.26
7.00	0.2	2.4	2.5	0.0	3.15	0.11	1.15	1.61	3.99	65.00	16.28
5.00	0.2	2.4	2.5	0.0	3.99	0.11	1.15	1.63	4.69	65.00	13.87
2.50	0.2	2.4	2.4	0.0	5.16	0.11	1.15	1.66	5.62	65.00	11.56
0.00	0.2	2.4	2.4	0.0	6.95	0.11	1.15	1.69	7.29	65.00	8.91

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	483	1101	1202	230
60.00	66	-45	80	0	865	1102	1401	566
55.00	132	-109	172	0	1267	1104	1680	922
50.00	199	-198	280	0	1689	1106	2019	1296
48.00	225	-241	329	0	1864	1107	2168	1450
48.00	225	-241	329	0	1864	1107	2168	1451
45.00	265	-312	410	0	2133	1109	2404	1805
45.00	331	214	394	511	2503	7361	7775	-620
40.00	772	50	774	511	2967	7364	7940	-7
35.00	1214	-142	1223	511	3450	7369	8137	637
32.00	1480	-272	1504	511	3749	7372	8270	1038
32.00	1443	14	1443	504	3681	7369	8237	1445
30.00	1620	-77	1622	504	3886	7370	8332	1716
30.00	1620	-89	1623	504	4692	7370	8737	1939
25.00	2063	-386	2098	504	5217	7373	9032	2641
21.25	2394	-630	2476	504	5626	7375	9276	3182
21.25	2421	-390	2452	480	8264	7369	11072	3710
20.00	2531	-515	2583	480	8401	7368	11174	3899
15.00	2973	-1036	3149	480	8966	7368	11605	4662
10.00	3416	-1591	3768	480	9550	7365	12061	5454
5.00	3858	-2182	4432	480	10154	7362	12542	6275
0.00	4299	-2811	5137	480	10783	7362	13057	7111

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	481	1102	1203	227
60.00	66	-45	80	0	862	1106	1402	564
55.00	133	-109	172	0	1264	1109	1682	919
50.00	199	-197	281	0	1686	1113	2021	1293
48.00	226	-240	330	0	1861	1115	2169	1448
48.00	226	-240	330	0	1861	1115	2169	1448
45.00	266	-312	410	0	2130	1118	2405	1802
45.00	139	635	650	7	7494	12025	14169	839
40.00	861	171	878	7	7959	12030	14425	1457
35.00	1583	-321	1615	7	8444	12035	14702	2106
32.00	2016	-630	2112	7	8745	12038	14879	2504
32.00	1713	326	1744	5	8768	11699	14620	7394
30.00	1994	113	1997	5	8973	11701	14746	7664
30.00	1994	101	1996	5	9781	11698	15248	7891
25.00	2696	-501	2742	5	10306	11694	15588	8601
21.25	3222	-974	3366	5	10715	11698	15863	9141
21.25	3101	-136	3104	5	9883	11668	15291	13689
20.00	3276	-286	3289	5	10020	11658	15373	13883
15.00	3976	-904	4077	5	10584	11642	15734	14654
10.00	4674	-1557	4927	5	11165	11623	16117	15456
5.00	5372	-2245	5822	5	11764	11600	16521	16288
0.00	6068	-2969	6755	5	12393	11601	16975	17123

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-5	5	0	478	1103	1202	230
60.00	66	-45	80	0	859	1107	1401	566
55.00	133	-109	172	0	1261	1111	1681	922
50.00	200	-197	280	0	1684	1114	2019	1295
48.00	226	-239	329	0	1859	1116	2168	1450
48.00	226	-239	329	0	1859	1116	2168	1450
45.00	267	-311	410	0	2127	1119	2404	1805
45.00	328	138	356	-502	2990	7345	7930	3383
40.00	769	-56	771	-502	3458	7347	8120	3999
35.00	1210	-278	1241	-502	3945	7349	8341	4644
32.00	1475	-425	1535	-502	4246	7353	8490	5042
32.00	1434	250	1456	-497	6835	7764	10344	9435
30.00	1621	83	1623	-497	7040	7766	10482	9706
30.00	1621	71	1622	-496	7850	7761	11039	9929
25.00	2086	-416	2127	-496	8377	7756	11416	10632
21.25	2435	-802	2564	-496	8785	7759	11721	11173
21.25	2458	-196	2466	-472	9496	7826	12305	15132
20.00	2576	-340	2598	-472	9634	7816	12406	15322
15.00	3045	-935	3185	-472	10198	7801	12840	16085
10.00	3513	-1565	3846	-472	10780	7783	13296	16878
5.00	3980	-2230	4562	-472	11380	7763	13775	17701
0.00	4446	-2932	5325	-472	12009	7763	14300	18536

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-322	523	614	61	2483	5468	6005	-2425
37.50	-158	446	473	61	2618	5466	6061	-2428
35.00	6	366	366	61	2755	5465	6120	-2428
33.00	138	298	329	61	2863	5465	6169	-2429
33.00	138	298	329	61	1824	1576	2410	-1328
30.00	194	230	301	61	1989	1575	2537	-1328
27.50	241	168	294	61	2126	1574	2645	-1329
25.00	289	102	306	61	2264	1573	2756	-1329
22.50	336	32	337	61	2401	1574	2870	-1328
20.00	383	-42	385	61	2538	1572	2986	-1328
20.00	383	-42	385	61	1505	-2320	2766	-234
17.50	313	-89	326	61	1643	-2321	2844	-235
15.00	244	-140	281	61	1782	-2323	2927	-236
12.50	174	-196	262	61	1919	-2325	3015	-236
10.00	104	-256	276	61	2057	-2326	3106	-236
7.00	20	-333	333	61	2223	-2328	3219	-235
7.00	20	-333	333	61	1191	-6224	6336	851
5.00	-129	-362	385	61	1301	-6225	6360	852
2.50	-316	-404	512	61	1439	-6227	6391	854
0.00	-502	-449	674	61	1576	-6228	6424	858

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-511	527	734	-66	2427	6251	6706	-375
37.50	-323	452	556	-66	2564	6251	6756	-375
35.00	-136	373	397	-66	2702	6250	6809	-380
33.00	14	307	307	-66	2813	6249	6853	-383
33.00	14	307	307	-66	1782	2361	2958	730
30.00	99	240	259	-66	1947	2361	3060	730
27.50	170	179	247	-66	2086	2360	3149	729
25.00	241	114	267	-66	2224	2358	3242	730
22.50	311	46	315	-66	2363	2357	3337	731
20.00	382	-27	383	-66	2500	2356	3436	731
20.00	382	-27	383	-66	1467	-1534	2123	1840
17.50	336	-73	344	-66	1605	-1535	2221	1839
15.00	290	-124	315	-66	1742	-1537	2323	1839
12.50	244	-178	302	-66	1880	-1539	2429	1838
10.00	198	-236	308	-66	2015	-1542	2538	1838
7.00	142	-312	343	-66	2181	-1544	2672	1838
7.00	142	-312	343	-66	1141	-5435	5554	2937
5.00	12	-341	341	-66	1251	-5437	5579	2937
2.50	-152	-380	409	-66	1384	-5438	5611	2940
0.00	-315	-424	528	-66	1521	-5439	5648	2940

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	99	273	291	150	-449	-377	586	1316
37.50	87	285	298	150	-311	-378	490	1317
35.00	76	292	302	150	-173	-379	417	1317
33.00	67	295	302	150	-63	-380	385	1317
33.00	99	295	311	86	818	-387	905	1738
30.00	85	262	276	86	983	-388	1057	1738
27.50	74	231	242	86	1121	-390	1187	1738
25.00	62	195	204	86	1260	-391	1319	1737
22.50	50	155	163	86	1398	-392	1452	1737
20.00	38	111	117	86	1536	-393	1586	1736
20.00	71	111	131	23	2417	-399	2450	2156
17.50	59	36	69	23	2555	-400	2586	2155
15.00	47	-42	63	23	2693	-401	2723	2155
12.50	35	-125	130	23	2830	-402	2859	2156
10.00	23	-212	213	23	2967	-403	2995	2157
7.00	8	-322	322	23	3133	-405	3159	2157
7.00	40	-322	325	-40	4011	-411	4032	2579
5.00	31	-420	421	-40	4120	-412	4140	2582
2.50	18	-545	546	-40	4255	-414	4275	2586
0.00	6	-675	675	-40	4392	-415	4412	2586

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	7	286	286	36	-404	-3	404	67
37.50	7	296	296	36	-267	-4	267	67
35.00	7	302	302	36	-129	-4	129	67
33.00	7	303	304	36	-19	-5	20	67
33.00	40	303	306	-27	860	-10	860	489
30.00	39	269	272	-27	1025	-10	1025	489
27.50	39	236	240	-27	1163	-11	1163	488
25.00	39	199	203	-27	1301	-12	1301	488
22.50	38	158	163	-27	1439	-12	1439	487
20.00	38	113	119	-27	1577	-13	1577	487
20.00	70	113	133	-90	2457	-18	2457	906
17.50	70	37	79	-90	2595	-19	2595	906
15.00	69	-43	81	-90	2733	-21	2733	906
12.50	68	-127	144	-90	2871	-23	2871	906
10.00	68	-215	226	-90	3008	-24	3008	907
7.00	67	-326	333	-90	3173	-25	3173	907
7.00	99	-327	341	-154	4053	-33	4053	1330
5.00	98	-425	437	-154	4162	-35	4162	1333
2.50	97	-552	561	-154	4298	-38	4298	1337
0.00	96	-683	690	-154	4435	-39	4436	1337

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	35	230	232	59	-555	-51	557	-549
37.50	34	244	247	59	-417	-52	421	-549
35.00	32	255	257	59	-280	-53	285	-549
33.00	31	260	262	59	-170	-54	179	-548
33.00	37	254	256	47	599	-58	602	-131
30.00	35	229	232	47	764	-59	766	-131
27.50	33	204	207	47	902	-60	904	-131
25.00	32	175	178	47	1039	-60	1041	-132
22.50	30	142	145	47	1177	-61	1179	-132
20.00	28	104	108	47	1315	-62	1316	-132
20.00	34	98	104	35	2085	-66	2086	284
17.50	32	33	46	35	2223	-66	2224	284
15.00	30	-35	47	35	2361	-67	2362	284
12.50	28	-108	112	35	2499	-68	2500	284
10.00	26	-185	187	35	2636	-69	2637	284
7.00	24	-283	284	35	2801	-69	2802	285
7.00	30	-290	291	23	3571	-73	3572	703
5.00	28	-377	378	23	3681	-73	3682	705
2.50	26	-489	490	23	3818	-74	3819	709
0.00	24	-606	606	23	3955	-75	3956	709

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	23	240	241	-26	-525	-6	525	-2640
37.50	23	254	255	-26	-389	-6	389	-2639
35.00	23	263	264	-26	-252	-6	252	-2639
33.00	23	268	269	-26	-142	-7	143	-2639
33.00	29	261	263	-38	626	-10	626	-2221
30.00	29	236	238	-38	790	-10	790	-2222
27.50	29	210	212	-38	927	-11	927	-2222
25.00	28	180	182	-38	1064	-11	1064	-2222
22.50	28	146	149	-38	1201	-12	1201	-2223
20.00	28	108	112	-38	1339	-12	1339	-2223
20.00	34	102	107	-50	2109	-16	2109	-1807
17.50	34	36	49	-50	2247	-17	2247	-1807
15.00	33	-33	47	-50	2385	-18	2385	-1807
12.50	33	-107	112	-50	2523	-18	2523	-1807
10.00	32	-185	187	-50	2661	-19	2661	-1807
7.00	31	-283	285	-50	2827	-20	2827	-1806
7.00	38	-290	292	-62	3597	-25	3597	-1387
5.00	37	-378	379	-62	3707	-25	3708	-1387
2.50	36	-491	492	-62	3846	-27	3846	-1385
0.00	35	-608	609	-62	3984	-28	3984	-1382

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.6	4.3	4.6	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	1.4	3.8	4.0	0.0	0.76	0.03	0.00	0.15	0.79	65.00	82.33
55.00	1.2	3.3	3.5	0.0	1.48	0.05	0.00	0.17	1.53	65.00	42.53
50.00	1.1	2.8	3.0	0.0	2.20	0.06	0.00	0.20	2.26	65.00	28.70
48.00	1.0	2.6	2.8	0.0	2.49	0.07	0.00	0.21	2.56	65.00	25.41
48.00	1.0	2.6	2.8	0.0	1.68	0.05	0.00	0.14	1.73	65.00	37.58
45.00	0.9	2.4	2.5	0.0	1.97	0.06	0.00	0.15	2.03	65.00	32.04
45.00	0.9	2.4	2.5	0.0	1.86	0.02	1.20	1.69	3.41	65.00	19.06
40.00	0.8	1.9	2.1	0.0	3.34	0.00	1.10	1.57	4.12	65.00	15.79
35.00	0.7	1.5	1.6	0.0	4.88	0.02	1.01	1.48	5.22	65.00	12.46
32.00	0.6	1.3	1.4	0.0	5.76	0.03	0.96	1.42	6.01	65.00	10.81
32.00	0.6	1.3	1.4	0.0	5.36	0.04	0.94	1.41	5.75	65.00	11.31
30.00	0.5	1.1	1.2	0.0	5.88	0.05	0.91	1.38	6.10	65.00	10.66
30.00	0.5	1.1	1.2	0.0	5.90	0.05	0.91	1.40	6.12	65.00	10.61
25.00	0.4	0.8	0.9	0.0	7.17	0.07	0.84	1.32	7.33	65.00	8.86
21.25	0.3	0.6	0.6	0.0	8.00	0.08	0.80	1.27	8.16	65.00	7.97
21.25	0.3	0.6	0.6	0.0	7.89	0.09	0.76	1.33	8.02	65.00	8.11
20.00	0.3	0.5	0.6	0.0	8.18	0.10	0.75	1.32	8.31	65.00	7.82
15.00	0.2	0.3	0.3	0.0	9.25	0.11	0.69	1.26	9.38	65.00	6.93
10.00	0.1	0.1	0.2	0.0	10.17	0.13	0.64	1.21	10.32	65.00	6.30
5.00	0.0	0.0	0.0	0.0	10.98	0.14	0.60	1.18	11.13	65.00	5.84
0.00	0.0	0.0	0.0	0.0	12.03	0.16	0.56	1.14	12.21	65.00	5.32

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.5	5.7	5.9	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	1.4	5.0	5.2	0.0	0.76	0.03	0.00	0.15	0.79	65.00	82.34
55.00	1.2	4.4	4.6	0.0	1.48	0.05	0.00	0.17	1.53	65.00	42.52
50.00	1.1	3.8	3.9	0.0	2.20	0.06	0.00	0.20	2.27	65.00	28.68
48.00	1.0	3.6	3.7	0.0	2.49	0.07	0.00	0.21	2.56	65.00	25.39
48.00	1.0	3.6	3.7	0.0	1.68	0.05	0.00	0.14	1.73	65.00	37.55
45.00	0.9	3.2	3.3	0.0	1.97	0.06	0.00	0.15	2.03	65.00	32.01
45.00	0.9	3.2	3.3	0.0	3.13	0.03	0.02	0.91	3.48	65.00	18.69
40.00	0.8	2.6	2.7	0.0	3.86	0.04	0.02	0.88	4.06	65.00	16.03
35.00	0.7	2.0	2.1	0.0	6.51	0.06	0.01	0.86	6.59	65.00	9.87
32.00	0.6	1.7	1.8	0.0	8.10	0.07	0.01	0.85	8.19	65.00	7.94
32.00	0.6	1.7	1.8	0.0	6.67	0.21	0.01	0.83	6.97	65.00	9.33
30.00	0.5	1.5	1.6	0.0	7.26	0.21	0.01	0.82	7.55	65.00	8.61
30.00	0.5	1.5	1.6	0.0	7.25	0.22	0.01	0.85	7.56	65.00	8.60
25.00	0.4	1.1	1.2	0.0	9.37	0.23	0.01	0.84	9.61	65.00	6.76
21.25	0.3	0.8	0.9	0.0	10.88	0.23	0.01	0.83	11.13	65.00	5.84
21.25	0.3	0.8	0.9	0.0	9.80	0.35	0.01	0.80	10.17	65.00	6.39
20.00	0.3	0.7	0.8	0.0	10.27	0.35	0.01	0.79	10.64	65.00	6.11
15.00	0.2	0.4	0.4	0.0	12.00	0.36	0.01	0.78	12.37	65.00	5.25
10.00	0.1	0.2	0.2	0.0	13.48	0.36	0.01	0.78	13.86	65.00	4.69
5.00	0.0	0.0	0.1	0.0	14.76	0.37	0.01	0.77	15.15	65.00	4.29
0.00	0.0	0.0	0.0	0.0	15.86	0.38	0.01	0.76	16.26	65.00	4.00

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.6	4.4	4.7	0.0	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	1.4	3.9	4.1	0.0	0.76	0.03	0.00	0.15	0.79	65.00	82.40
55.00	1.2	3.4	3.6	0.0	1.48	0.05	0.00	0.17	1.53	65.00	42.55
50.00	1.1	2.9	3.1	0.0	2.20	0.06	0.00	0.20	2.26	65.00	28.70
48.00	1.0	2.7	2.9	0.0	2.49	0.07	0.00	0.21	2.56	65.00	25.41
48.00	1.0	2.7	2.9	0.0	1.68	0.05	0.00	0.14	1.73	65.00	37.57
45.00	0.9	2.4	2.6	0.0	1.97	0.06	0.00	0.15	2.03	65.00	32.03
45.00	0.9	2.4	2.6	0.0	1.70	0.11	1.18	1.68	3.31	65.00	19.62
40.00	0.8	2.0	2.1	0.0	3.34	0.12	1.08	1.57	4.11	65.00	15.80
35.00	0.7	1.5	1.7	0.0	5.01	0.13	0.99	1.47	5.48	65.00	11.86
32.00	0.6	1.3	1.4	0.0	5.89	0.14	0.94	1.42	6.31	65.00	10.31
32.00	0.6	1.3	1.4	0.0	5.56	0.26	0.93	1.51	6.32	65.00	10.28
30.00	0.5	1.2	1.3	0.0	5.89	0.27	0.90	1.48	6.61	65.00	9.83
30.00	0.5	1.2	1.3	0.0	5.88	0.27	0.90	1.51	6.63	65.00	9.80
25.00	0.4	0.8	0.9	0.0	7.27	0.28	0.83	1.44	7.82	65.00	8.32
21.25	0.3	0.6	0.7	0.0	8.28	0.29	0.78	1.39	8.78	65.00	7.40
21.25	0.3	0.6	0.7	0.0	7.84	0.39	0.75	1.38	8.45	65.00	7.69
20.00	0.3	0.5	0.6	0.0	8.17	0.39	0.73	1.37	8.77	65.00	7.41
15.00	0.2	0.3	0.3	0.0	9.37	0.39	0.68	1.31	9.94	65.00	6.54
10.00	0.1	0.1	0.2	0.0	10.41	0.40	0.63	1.26	10.96	65.00	5.93
5.00	0.0	0.0	0.0	0.0	11.31	0.40	0.59	1.22	11.84	65.00	5.49
0.00	0.0	0.0	0.0	0.0	12.48	0.41	0.55	1.19	12.95	65.00	5.02

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.9	3.2	3.3	0.0	9.65	0.16	0.47	1.31	9.97	65.00	6.52
37.50	0.9	3.2	3.3	0.1	7.52	0.17	0.47	1.31	7.89	65.00	8.24
35.00	0.9	3.2	3.3	0.1	5.42	0.17	0.47	1.32	6.03	65.00	10.78
33.00	0.9	3.2	3.4	0.1	5.22	0.17	0.47	1.33	5.86	65.00	11.10
33.00	0.9	3.2	3.4	0.1	5.22	0.09	0.47	0.81	5.48	65.00	11.86
30.00	0.9	3.2	3.4	0.1	4.56	0.09	0.47	0.82	4.84	65.00	13.42
27.50	0.9	3.2	3.4	0.1	4.57	0.09	0.47	0.84	4.88	65.00	13.33
25.00	0.9	3.2	3.4	0.1	4.86	0.09	0.47	0.86	5.17	65.00	12.58
22.50	0.9	3.2	3.3	0.0	5.13	0.09	0.47	0.87	5.43	65.00	11.96
20.00	0.9	3.2	3.3	0.0	5.88	0.09	0.47	0.89	6.10	65.00	10.65
20.00	0.9	3.2	3.3	0.0	5.88	0.02	0.47	0.86	6.06	65.00	10.73
17.50	0.9	3.1	3.2	0.0	5.15	0.02	0.47	0.87	5.35	65.00	12.15
15.00	0.9	3.0	3.2	-0.1	4.44	0.02	0.47	0.88	4.68	65.00	13.90
12.50	0.9	2.9	3.1	-0.1	3.94	0.02	0.47	0.89	4.23	65.00	15.35
10.00	0.9	2.8	3.0	-0.1	4.39	0.02	0.47	0.90	4.66	65.00	13.94
7.00	0.9	2.7	2.9	-0.1	5.01	0.02	0.47	0.92	5.26	65.00	12.36
7.00	0.9	2.7	2.9	-0.1	5.01	0.06	0.47	1.35	5.47	65.00	11.89
5.00	0.9	2.6	2.8	-0.1	6.11	0.06	0.47	1.36	6.40	65.00	10.15
2.50	0.9	2.5	2.7	0.0	7.85	0.06	0.47	1.36	8.07	65.00	8.06
0.00	0.9	2.4	2.6	0.0	10.12	0.06	0.47	1.37	10.19	65.00	6.38

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.9	2.4	2.5	0.0	10.85	0.03	0.50	1.44	11.02	65.00	5.90
37.50	0.9	2.5	2.6	0.1	8.61	0.03	0.50	1.44	8.82	65.00	7.37
35.00	0.9	2.6	2.7	0.1	6.31	0.03	0.50	1.45	6.60	65.00	9.85
33.00	0.9	2.6	2.8	0.1	4.59	0.03	0.50	1.46	5.22	65.00	12.46
33.00	0.9	2.6	2.8	0.1	4.59	0.05	0.50	0.91	4.90	65.00	13.27
30.00	0.9	2.8	2.9	0.1	4.13	0.05	0.50	0.93	4.46	65.00	14.56
27.50	0.9	2.9	3.0	0.1	3.67	0.05	0.50	0.94	4.04	65.00	16.08
25.00	0.9	3.0	3.1	0.1	4.23	0.05	0.50	0.96	4.57	65.00	14.23
22.50	0.9	3.1	3.2	0.0	4.86	0.05	0.50	0.97	5.16	65.00	12.59
20.00	0.9	3.1	3.3	0.0	5.78	0.05	0.50	0.98	5.96	65.00	10.91
20.00	0.9	3.1	3.3	0.0	5.78	0.13	0.50	0.80	6.06	65.00	10.73
17.50	0.9	3.2	3.3	0.0	5.39	0.13	0.50	0.81	5.68	65.00	11.44
15.00	0.9	3.2	3.3	0.0	5.02	0.13	0.50	0.83	5.33	65.00	12.20
12.50	0.9	3.2	3.4	-0.1	4.67	0.13	0.50	0.84	5.00	65.00	12.99
10.00	0.9	3.2	3.4	-0.1	4.68	0.13	0.50	0.86	5.00	65.00	12.99
7.00	0.9	3.2	3.4	-0.1	5.45	0.13	0.50	0.88	5.75	65.00	11.30
7.00	0.9	3.2	3.4	-0.1	5.45	0.20	0.50	1.28	6.06	65.00	10.73
5.00	0.9	3.2	3.3	-0.1	5.08	0.20	0.50	1.28	5.72	65.00	11.37
2.50	0.9	3.2	3.3	0.0	6.51	0.20	0.50	1.28	6.99	65.00	9.30
0.00	0.9	3.2	3.3	0.0	8.15	0.20	0.50	1.29	8.57	65.00	7.59

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	1.7	1.8	0.0	4.62	0.09	1.15	1.23	5.16	65.00	12.60
37.50	0.6	1.7	1.8	0.1	4.72	0.09	1.15	1.22	5.24	65.00	12.39
35.00	0.6	1.7	1.8	0.1	4.75	0.09	1.15	1.21	5.27	65.00	12.32
33.00	0.6	1.7	1.8	0.1	4.74	0.09	1.15	1.20	5.26	65.00	12.36
33.00	0.6	1.7	1.8	0.1	4.93	0.12	0.66	0.79	5.18	65.00	12.54
30.00	0.6	1.7	1.8	0.2	4.37	0.12	0.66	0.81	4.63	65.00	14.03
27.50	0.6	1.7	1.8	0.2	3.84	0.12	0.66	0.83	4.11	65.00	15.80
25.00	0.6	1.7	1.8	0.1	3.24	0.12	0.66	0.85	3.54	65.00	18.36
22.50	0.6	1.6	1.7	0.1	2.58	0.12	0.66	0.86	2.92	65.00	22.27
20.00	0.6	1.6	1.7	0.1	1.86	0.12	0.66	0.88	2.26	65.00	28.71
20.00	0.6	1.6	1.7	0.1	2.06	0.15	0.18	0.52	2.21	65.00	29.37
17.50	0.6	1.6	1.7	0.1	1.08	0.15	0.18	0.54	1.26	65.00	51.68
15.00	0.6	1.5	1.6	0.0	0.94	0.15	0.18	0.56	1.24	65.00	52.59
12.50	0.6	1.5	1.6	0.0	2.05	0.15	0.18	0.58	2.20	65.00	29.54
10.00	0.6	1.5	1.6	0.0	3.26	0.15	0.18	0.59	3.41	65.00	19.09
7.00	0.6	1.4	1.5	-0.1	4.78	0.15	0.18	0.62	4.93	65.00	13.18
7.00	0.6	1.4	1.5	-0.1	4.98	0.18	0.31	0.87	5.25	65.00	12.37
5.00	0.6	1.4	1.5	-0.1	6.36	0.18	0.31	0.88	6.61	65.00	9.83
2.50	0.6	1.3	1.5	0.0	8.13	0.18	0.31	0.90	8.37	65.00	7.77
0.00	0.6	1.3	1.4	0.0	9.96	0.18	0.31	0.92	10.19	65.00	6.38

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	1.3	1.4	0.0	4.24	0.00	0.28	0.34	4.28	65.00	15.18
37.50	0.6	1.3	1.4	0.1	4.39	0.00	0.28	0.32	4.43	65.00	14.69
35.00	0.6	1.4	1.5	0.1	4.48	0.00	0.28	0.30	4.51	65.00	14.41
33.00	0.6	1.4	1.5	0.1	4.50	0.00	0.28	0.28	4.53	65.00	14.34
33.00	0.6	1.4	1.5	0.1	4.70	0.03	0.21	0.33	4.75	65.00	13.68
30.00	0.6	1.4	1.6	0.2	4.20	0.03	0.21	0.35	4.25	65.00	15.28
27.50	0.6	1.5	1.6	0.2	3.71	0.03	0.21	0.37	3.77	65.00	17.23
25.00	0.6	1.5	1.6	0.1	3.17	0.03	0.21	0.39	3.23	65.00	20.10
22.50	0.6	1.6	1.7	0.1	2.56	0.03	0.21	0.41	2.64	65.00	24.63
20.00	0.6	1.6	1.7	0.1	1.89	0.03	0.21	0.43	1.99	65.00	32.67
20.00	0.6	1.6	1.7	0.1	2.09	0.06	0.69	1.04	2.58	65.00	25.24
17.50	0.6	1.6	1.7	0.1	1.25	0.06	0.69	1.05	2.21	65.00	29.45
15.00	0.6	1.6	1.7	0.0	1.28	0.06	0.69	1.07	2.25	65.00	28.88
12.50	0.6	1.7	1.8	0.0	2.28	0.06	0.69	1.09	2.77	65.00	23.49
10.00	0.6	1.7	1.8	0.0	3.58	0.06	0.69	1.11	3.93	65.00	16.55
7.00	0.6	1.7	1.8	-0.1	5.21	0.06	0.69	1.14	5.48	65.00	11.87
7.00	0.6	1.7	1.8	-0.1	5.41	0.09	1.18	1.74	6.01	65.00	10.82
5.00	0.6	1.7	1.8	-0.1	6.85	0.09	1.18	1.76	7.36	65.00	8.84
2.50	0.6	1.7	1.8	0.0	8.71	0.09	1.18	1.78	9.13	65.00	7.12
0.00	0.6	1.7	1.8	0.0	10.63	0.09	1.18	1.80	11.00	65.00	5.91

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.8	0.9	0.0	3.59	0.04	0.45	0.53	3.70	65.00	17.57
37.50	0.3	0.8	0.9	0.1	3.80	0.04	0.45	0.51	3.90	65.00	16.66
35.00	0.3	0.8	0.8	0.1	3.94	0.04	0.45	0.49	4.05	65.00	16.06
33.00	0.3	0.8	0.8	0.1	4.01	0.04	0.45	0.47	4.12	65.00	15.78
33.00	0.3	0.8	0.8	0.1	3.96	0.01	0.36	0.44	4.02	65.00	16.17
30.00	0.3	0.8	0.8	0.1	3.58	0.01	0.36	0.47	3.65	65.00	17.79
27.50	0.3	0.8	0.8	0.1	3.20	0.01	0.36	0.48	3.29	65.00	19.78
25.00	0.3	0.8	0.8	0.1	2.77	0.01	0.36	0.50	2.86	65.00	22.71
22.50	0.3	0.8	0.8	0.1	2.27	0.01	0.36	0.52	2.38	65.00	27.26
20.00	0.3	0.7	0.8	0.1	1.70	0.01	0.36	0.54	1.86	65.00	34.91
20.00	0.3	0.7	0.8	0.1	1.65	0.02	0.27	0.56	1.75	65.00	37.14
17.50	0.3	0.7	0.8	0.0	0.69	0.02	0.27	0.58	1.16	65.00	56.16
15.00	0.3	0.7	0.8	0.0	0.71	0.02	0.27	0.60	1.18	65.00	54.89
12.50	0.3	0.7	0.8	0.0	1.77	0.02	0.27	0.62	1.88	65.00	34.50
10.00	0.3	0.7	0.7	0.0	2.88	0.02	0.27	0.64	2.95	65.00	22.00
7.00	0.3	0.7	0.7	-0.1	4.31	0.02	0.27	0.66	4.35	65.00	14.94
7.00	0.3	0.7	0.7	-0.1	4.44	0.05	0.18	0.67	4.49	65.00	14.47
5.00	0.3	0.6	0.7	-0.1	5.71	0.05	0.18	0.69	5.76	65.00	11.28
2.50	0.3	0.6	0.7	0.0	7.35	0.05	0.18	0.71	7.40	65.00	8.78
0.00	0.3	0.6	0.7	0.0	9.05	0.05	0.18	0.73	9.10	65.00	7.14

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2TC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.6	0.6	0.0	3.67	0.18	0.20	0.27	3.87	65.00	16.80
37.50	0.3	0.6	0.7	0.1	3.87	0.18	0.20	0.26	4.07	65.00	15.98
35.00	0.3	0.6	0.7	0.1	4.01	0.18	0.20	0.24	4.20	65.00	15.46
33.00	0.3	0.6	0.7	0.1	4.08	0.18	0.20	0.22	4.27	65.00	15.21
33.00	0.3	0.6	0.7	0.1	4.02	0.15	0.29	0.38	4.20	65.00	15.49
30.00	0.3	0.7	0.7	0.1	3.64	0.15	0.29	0.40	3.82	65.00	17.02
27.50	0.3	0.7	0.7	0.1	3.26	0.15	0.29	0.42	3.44	65.00	18.89
25.00	0.3	0.7	0.8	0.1	2.82	0.15	0.29	0.44	3.00	65.00	21.66
22.50	0.3	0.7	0.8	0.1	2.32	0.15	0.29	0.46	2.50	65.00	25.97
20.00	0.3	0.7	0.8	0.1	1.76	0.15	0.29	0.48	1.95	65.00	33.37
20.00	0.3	0.7	0.8	0.1	1.70	0.12	0.38	0.68	1.88	65.00	34.48
17.50	0.3	0.7	0.8	0.1	0.74	0.12	0.38	0.70	1.31	65.00	49.74
15.00	0.3	0.8	0.8	0.0	0.69	0.12	0.38	0.72	1.33	65.00	49.03
12.50	0.3	0.8	0.8	0.0	1.77	0.12	0.38	0.74	1.94	65.00	33.52
10.00	0.3	0.8	0.8	0.0	2.91	0.12	0.38	0.76	3.06	65.00	21.25
7.00	0.3	0.8	0.8	-0.1	4.36	0.12	0.38	0.78	4.50	65.00	14.46
7.00	0.3	0.8	0.8	-0.1	4.49	0.09	0.48	0.98	4.61	65.00	14.10
5.00	0.3	0.8	0.8	-0.1	5.77	0.09	0.48	0.99	5.89	65.00	11.04
2.50	0.3	0.8	0.9	0.0	7.44	0.09	0.48	1.01	7.54	65.00	8.62
0.00	0.3	0.8	0.9	0.0	9.16	0.09	0.48	1.03	9.26	65.00	7.02

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	405	1182	1249	221
60.00	87	-24	91	0	407	1568	1619	558
55.00	194	-49	200	0	408	1974	2016	914
50.00	325	-73	333	0	410	2401	2436	1288
48.00	385	-83	393	0	411	2578	2610	1442
48.00	385	-83	393	0	411	2577	2610	1443
45.00	482	-98	492	0	413	2851	2880	1797
45.00	576	139	593	656	1838	11050	11202	519
40.00	1253	29	1254	656	1840	11522	11668	1132
35.00	1960	-81	1961	656	1831	12014	12153	1792
32.00	2398	-147	2402	656	1833	12319	12455	2189
32.00	2391	-160	2396	787	656	14577	14591	3829
30.00	2743	-176	2749	787	656	14784	14799	4100
30.00	2755	-176	2761	787	653	15590	15604	4326
25.00	3707	-215	3713	787	648	16116	16129	5044
21.25	4441	-244	4448	787	649	16529	16542	5585
21.25	4484	-285	4493	891	1875	18543	18637	7239
20.00	4763	-312	4774	891	1870	18674	18768	7445
15.00	5901	-424	5916	891	1863	19231	19321	8236
10.00	7073	-535	7093	891	1855	19804	19891	9059
5.00	8279	-646	8305	891	1847	20393	20476	9913
0.00	9522	-757	9552	891	1847	21023	21104	10748

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	400	1184	1250	217
60.00	87	-24	91	0	401	1571	1621	554
55.00	194	-48	200	0	401	1978	2019	910
50.00	326	-72	333	0	401	2407	2440	1284
48.00	385	-82	394	0	401	2584	2615	1438
48.00	385	-82	394	0	401	2584	2615	1439
45.00	483	-96	493	0	401	2858	2886	1793
45.00	296	275	404	-1	3845	16602	17042	703
40.00	1306	44	1307	-1	3846	17075	17503	1330
35.00	2345	-186	2353	-1	3846	17568	17984	1987
32.00	2983	-325	3001	-1	3847	17874	18284	2385
32.00	2617	30	2617	-2	3396	21352	21621	7232
30.00	3132	-52	3133	-2	3397	21561	21826	7503
30.00	3144	-52	3145	-2	3397	22362	22619	7736
25.00	4502	-256	4509	-2	3396	22883	23134	8470
21.25	5541	-409	5556	-2	3397	23298	23544	9011
21.25	5344	-130	5346	-2	2820	27374	27519	13531
20.00	5756	-173	5758	-2	2819	27494	27638	13755
15.00	7423	-342	7431	-2	2818	28031	28173	14578
10.00	9122	-511	9137	-2	2816	28581	28720	15438
5.00	10856	-680	10877	-2	2813	29144	29280	16334
0.00	12623	-849	12652	-2	2813	29774	29907	17169

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	5	0	5	0	396	1185	1249	221
60.00	87	-24	91	0	395	1571	1619	558
55.00	194	-47	200	0	393	1977	2016	914
50.00	325	-71	333	0	392	2404	2436	1288
48.00	385	-80	393	0	391	2581	2610	1442
48.00	385	-80	393	0	391	2581	2610	1443
45.00	483	-94	492	0	391	2854	2880	1797
45.00	577	51	579	-657	2120	11063	11264	2089
40.00	1255	-77	1257	-657	2125	11532	11726	2711
35.00	1961	-204	1972	-657	2128	12021	12207	3361
32.00	2399	-281	2416	-657	2127	12326	12508	3759
32.00	2392	88	2394	-789	3762	14583	15060	6877
30.00	2745	-2	2745	-789	3762	14790	15261	7147
30.00	2757	-2	2757	-789	3765	15592	16040	7373
25.00	3708	-228	3715	-789	3770	16112	16548	8092
21.25	4443	-398	4461	-789	3770	16525	16950	8632
21.25	4486	-77	4487	-894	3125	18535	18797	11453
20.00	4765	-124	4767	-894	3129	18661	18921	11659
15.00	5902	-312	5910	-894	3135	19207	19461	12450
10.00	7072	-501	7090	-894	3140	19769	20017	13273
5.00	8276	-690	8305	-894	3144	20346	20588	14127
0.00	9516	-878	9557	-894	3144	20976	21211	14963

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-336	240	413	94	1331	6870	6997	-1552
37.50	-133	198	239	94	1463	6655	6814	-1554
35.00	63	152	164	94	1597	6441	6636	-1554
33.00	216	112	243	94	1702	6270	6497	-1554
33.00	216	112	243	94	634	2389	2471	-452
30.00	297	87	309	94	794	2131	2275	-452
27.50	358	61	368	94	928	1918	2130	-451
25.00	412	31	413	94	1061	1704	2008	-449
22.50	460	-3	460	94	1195	1491	1910	-448
20.00	501	-41	503	94	1329	1276	1843	-448
20.00	501	-41	503	94	266	-2610	2623	640
17.50	420	-51	423	94	401	-2824	2853	638
15.00	332	-65	338	94	536	-3039	3086	637
12.50	238	-83	252	94	671	-3253	3321	635
10.00	137	-105	172	94	806	-3467	3559	635
7.00	7	-137	137	94	967	-3724	3847	635
7.00	7	-137	137	94	-92	-7614	7615	1714
5.00	-177	-136	224	94	16	-7785	7785	1714
2.50	-414	-138	437	94	151	-7999	8000	1716
0.00	-657	-145	673	94	287	-8211	8216	1722

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-656	237	697	-94	1282	8199	8298	-1432
37.50	-413	197	457	-94	1418	7983	8108	-1438
35.00	-177	152	233	-94	1552	7769	7923	-1438
33.00	8	114	114	-94	1661	7597	7777	-1441
33.00	8	114	114	-94	603	3719	3767	-321
30.00	137	89	163	-94	765	3462	3545	-320
27.50	238	64	246	-94	900	3248	3370	-319
25.00	332	35	334	-94	1035	3033	3205	-317
22.50	420	2	420	-94	1170	2819	3052	-315
20.00	501	-35	502	-94	1304	2605	2913	-315
20.00	501	-35	502	-94	241	-1275	1298	797
17.50	460	-44	462	-94	375	-1490	1536	796
15.00	412	-58	416	-94	508	-1705	1779	795
12.50	357	-75	365	-94	642	-1919	2024	795
10.00	297	-96	312	-94	776	-2134	2271	794
7.00	215	-127	250	-94	936	-2392	2568	793
7.00	215	-127	250	-94	-133	-6275	6276	1891
5.00	62	-125	140	-94	-26	-6446	6446	1891
2.50	-134	-126	184	-94	105	-6660	6661	1892
0.00	-337	-132	362	-94	239	-6875	6879	1892

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-5	-26	27	183	-1678	1737	2415	1629
37.50	44	22	49	183	-1544	1523	2169	1629
35.00	86	66	109	183	-1410	1308	1923	1629
33.00	116	99	152	183	-1303	1137	1729	1629
33.00	116	99	152	120	-425	944	1036	1630
30.00	145	111	183	120	-264	687	736	1630
27.50	163	117	200	120	-129	473	490	1630
25.00	173	119	210	120	6	259	259	1631
22.50	178	117	213	120	141	45	148	1631
20.00	176	111	208	120	276	-170	324	1631
20.00	176	111	208	56	1154	-361	1209	1630
17.50	162	74	178	56	1289	-575	1411	1630
15.00	142	33	145	56	1424	-788	1628	1629
12.50	115	-11	115	56	1559	-1002	1854	1629
10.00	81	-60	101	56	1694	-1216	2085	1629
7.00	33	-124	128	56	1856	-1473	2369	1629
7.00	33	-124	128	-7	2733	-1663	3199	1628
5.00	-9	-191	191	-7	2841	-1834	3381	1629
2.50	-67	-278	286	-7	2975	-2047	3611	1631
0.00	-132	-369	392	-7	3110	-2261	3845	1631

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-131	-14	132	7	-1632	2259	2787	1174
37.50	-67	33	74	7	-1497	2045	2535	1174
35.00	-8	76	77	7	-1362	1832	2283	1174
33.00	34	108	113	7	-1254	1661	2081	1174
33.00	34	107	113	-56	-376	1470	1518	1175
30.00	82	118	144	-56	-214	1214	1233	1175
27.50	115	122	168	-56	-79	1000	1003	1176
25.00	142	123	188	-56	57	786	788	1176
22.50	162	119	201	-56	192	572	604	1176
20.00	176	111	208	-56	327	358	485	1176
20.00	176	111	208	-120	1205	167	1216	1176
17.50	178	73	192	-120	1340	-47	1341	1176
15.00	173	31	176	-120	1475	-261	1498	1176
12.50	162	-16	163	-120	1609	-476	1678	1175
10.00	145	-66	159	-120	1744	-690	1875	1175
7.00	115	-132	175	-120	1905	-948	2128	1175
7.00	115	-132	175	-183	2782	-1141	3006	1175
5.00	86	-200	217	-183	2888	-1313	3173	1176
2.50	43	-288	291	-183	3022	-1528	3386	1177
0.00	-6	-381	381	-183	3156	-1743	3605	1177

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-110	-49	120	98	-1664	2042	2634	-651
37.50	-52	-1	52	98	-1529	1828	2383	-651
35.00	0	43	43	98	-1394	1614	2133	-651
33.00	37	75	84	98	-1286	1443	1933	-651
33.00	37	75	84	80	-519	1226	1331	-650
30.00	76	91	119	80	-357	970	1034	-650
27.50	102	100	143	80	-222	757	788	-649
25.00	122	104	160	80	-87	543	550	-649
22.50	135	105	171	80	49	330	333	-649
20.00	141	102	174	80	184	117	218	-649
20.00	141	102	174	62	952	-99	957	-650
17.50	135	71	153	62	1087	-312	1131	-650
15.00	123	36	128	62	1223	-525	1331	-650
12.50	104	-2	104	62	1358	-739	1546	-650
10.00	78	-45	91	62	1494	-951	1771	-651
7.00	40	-102	109	62	1657	-1207	2050	-651
7.00	40	-102	109	43	2425	-1423	2812	-651
5.00	3	-161	161	43	2533	-1593	2993	-651
2.50	-48	-239	244	43	2669	-1806	3223	-650
0.00	-105	-322	338	43	2806	-2019	3457	-649

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-105	-41	112	-43	-1639	2018	2600	-1231
37.50	-47	6	48	-43	-1504	1805	2349	-1230
35.00	4	50	50	-43	-1368	1592	2099	-1230
33.00	40	81	90	-43	-1259	1422	1899	-1230
33.00	40	81	90	-62	-491	1206	1302	-1229
30.00	79	96	124	-62	-329	950	1005	-1229
27.50	104	104	147	-62	-193	737	762	-1229
25.00	123	107	163	-62	-58	524	527	-1229
22.50	135	107	173	-62	77	311	321	-1229
20.00	142	103	175	-62	213	98	234	-1229
20.00	142	103	175	-80	981	-118	988	-1229
17.50	135	71	153	-80	1116	-332	1164	-1229
15.00	122	36	127	-80	1251	-545	1365	-1229
12.50	102	-4	102	-80	1386	-758	1580	-1229
10.00	76	-47	90	-80	1522	-972	1805	-1230
7.00	37	-105	111	-80	1684	-1228	2084	-1230
7.00	37	-105	111	-98	2451	-1445	2846	-1230
5.00	0	-165	165	-98	2560	-1617	3027	-1229
2.50	-52	-244	250	-98	2695	-1830	3258	-1229
0.00	-110	-327	345	-98	2830	-2044	3491	-1228

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.6	8.4	8.4	0.1	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	0.5	7.4	7.5	0.0	0.87	0.03	0.00	0.18	0.90	65.00	71.99
55.00	0.4	6.5	6.5	0.0	1.73	0.05	0.00	0.21	1.78	65.00	36.56
50.00	0.4	5.6	5.6	0.0	2.61	0.06	0.00	0.24	2.67	65.00	24.30
48.00	0.4	5.3	5.3	0.0	2.97	0.07	0.00	0.25	3.04	65.00	21.40
48.00	0.4	5.3	5.3	0.0	2.01	0.05	0.00	0.17	2.05	65.00	31.65
45.00	0.3	4.7	4.7	0.0	2.37	0.06	0.00	0.18	2.43	65.00	26.78
45.00	0.3	4.7	4.7	0.0	2.86	0.02	1.54	2.25	4.40	65.00	14.78
40.00	0.3	3.9	3.9	0.0	5.37	0.03	1.41	2.11	6.09	65.00	10.68
35.00	0.2	3.1	3.1	0.0	7.73	0.05	1.29	1.99	8.13	65.00	7.99
32.00	0.2	2.6	2.6	0.0	9.03	0.06	1.23	1.93	9.37	65.00	6.93
32.00	0.2	2.6	2.6	0.0	9.02	0.11	1.47	2.30	9.57	65.00	6.79
30.00	0.2	2.3	2.3	0.0	10.01	0.11	1.43	2.25	10.49	65.00	6.19
30.00	0.2	2.3	2.3	0.0	10.05	0.12	1.43	2.29	10.55	65.00	6.16
25.00	0.1	1.7	1.7	0.0	12.46	0.13	1.32	2.18	12.86	65.00	5.05
21.25	0.1	1.2	1.2	0.0	14.07	0.14	1.24	2.10	14.43	65.00	4.50
21.25	0.1	1.2	1.2	0.0	14.24	0.19	1.41	2.37	14.68	65.00	4.43
20.00	0.1	1.1	1.1	0.0	14.85	0.19	1.38	2.34	15.28	65.00	4.26
15.00	0.0	0.6	0.6	0.0	17.11	0.20	1.28	2.23	17.49	65.00	3.72
10.00	0.0	0.3	0.3	0.0	19.11	0.21	1.20	2.14	19.46	65.00	3.34
5.00	0.0	0.1	0.1	0.0	20.89	0.23	1.12	2.06	21.23	65.00	3.06
0.00	0.0	0.0	0.0	0.0	22.48	0.24	1.04	1.98	22.81	65.00	2.85

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.6	10.5	10.5	0.1	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	0.5	9.3	9.3	0.1	0.87	0.03	0.00	0.18	0.90	65.00	71.94
55.00	0.4	8.2	8.2	0.1	1.73	0.05	0.00	0.21	1.78	65.00	36.53
50.00	0.4	7.1	7.1	0.1	2.61	0.06	0.00	0.24	2.68	65.00	24.28
48.00	0.4	6.7	6.7	0.1	2.97	0.07	0.00	0.25	3.04	65.00	21.38
48.00	0.4	6.7	6.7	0.1	2.01	0.05	0.00	0.17	2.06	65.00	31.61
45.00	0.3	6.0	6.0	0.0	2.37	0.06	0.00	0.18	2.43	65.00	26.75
45.00	0.3	6.0	6.0	0.0	1.95	0.02	0.00	1.08	2.55	65.00	25.47
40.00	0.3	4.9	5.0	0.0	5.61	0.04	0.00	1.06	5.71	65.00	11.38
35.00	0.2	3.9	3.9	0.0	9.34	0.06	0.00	1.04	9.40	65.00	6.92
32.00	0.2	3.4	3.4	0.0	11.38	0.07	0.00	1.03	11.45	65.00	5.68
32.00	0.2	3.4	3.4	0.0	9.73	0.20	0.00	1.22	9.97	65.00	6.52
30.00	0.2	3.0	3.0	0.0	11.28	0.21	0.00	1.21	11.49	65.00	5.66
30.00	0.2	3.0	3.0	0.0	11.33	0.21	0.00	1.25	11.54	65.00	5.63
25.00	0.1	2.1	2.1	0.0	15.13	0.22	0.00	1.23	15.35	65.00	4.23
21.25	0.1	1.6	1.6	0.0	17.65	0.23	0.00	1.21	17.88	65.00	3.64
21.25	0.1	1.6	1.6	0.0	16.80	0.35	0.00	1.42	17.15	65.00	3.79
20.00	0.1	1.4	1.4	0.0	17.78	0.35	0.00	1.41	18.13	65.00	3.58
15.00	0.1	0.8	0.8	0.0	21.38	0.36	0.00	1.39	21.74	65.00	2.99
10.00	0.0	0.4	0.4	0.0	24.52	0.36	0.00	1.37	24.89	65.00	2.61
5.00	0.0	0.1	0.1	0.0	27.28	0.37	0.00	1.35	27.65	65.00	2.35
0.00	0.0	0.0	0.0	0.0	29.70	0.38	0.00	1.33	30.08	65.00	2.16

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.6	8.4	8.4	0.1	0.05	0.01	0.00	0.14	0.25	65.00	99.90
60.00	0.5	7.4	7.5	0.1	0.87	0.03	0.00	0.18	0.90	65.00	71.98
55.00	0.4	6.5	6.5	0.0	1.73	0.05	0.00	0.21	1.78	65.00	36.57
50.00	0.4	5.6	5.6	0.0	2.61	0.06	0.00	0.24	2.67	65.00	24.31
48.00	0.4	5.3	5.3	0.0	2.97	0.07	0.00	0.25	3.04	65.00	21.41
48.00	0.4	5.3	5.3	0.0	2.01	0.05	0.00	0.17	2.05	65.00	31.66
45.00	0.3	4.7	4.7	0.0	2.37	0.06	0.00	0.18	2.43	65.00	26.80
45.00	0.3	4.7	4.7	0.0	2.75	0.07	1.55	2.26	4.31	65.00	15.09
40.00	0.3	3.9	3.9	0.0	5.43	0.08	1.41	2.12	6.10	65.00	10.65
35.00	0.2	3.1	3.1	0.0	7.86	0.10	1.30	2.00	8.24	65.00	7.89
32.00	0.2	2.6	2.6	0.0	9.17	0.10	1.23	1.93	9.50	65.00	6.84
32.00	0.2	2.6	2.6	0.0	8.96	0.19	1.48	2.33	9.72	65.00	6.69
30.00	0.2	2.3	2.3	0.0	9.85	0.20	1.43	2.28	10.54	65.00	6.17
30.00	0.2	2.3	2.3	0.0	9.89	0.20	1.43	2.32	10.59	65.00	6.14
25.00	0.1	1.7	1.7	0.0	12.48	0.21	1.32	2.20	12.89	65.00	5.04
21.25	0.1	1.2	1.2	0.0	14.21	0.22	1.25	2.12	14.58	65.00	4.46
21.25	0.1	1.2	1.2	0.0	14.07	0.29	1.41	2.38	14.58	65.00	4.46
20.00	0.1	1.1	1.1	0.0	14.70	0.30	1.39	2.35	15.16	65.00	4.29
15.00	0.1	0.6	0.6	0.0	17.03	0.30	1.29	2.24	17.45	65.00	3.72
10.00	0.0	0.3	0.3	0.0	19.08	0.31	1.20	2.15	19.49	65.00	3.34
5.00	0.0	0.1	0.1	0.0	20.91	0.32	1.12	2.06	21.30	65.00	3.05
0.00	0.0	0.0	0.0	0.0	22.54	0.33	1.05	1.99	22.93	65.00	2.84

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	6.0	6.0	0.0	6.40	0.11	0.72	1.69	6.70	65.00	9.71
37.50	0.3	6.0	6.0	0.1	3.72	0.11	0.72	1.67	4.62	65.00	14.07
35.00	0.3	6.0	6.0	0.1	2.62	0.11	0.72	1.64	3.92	65.00	16.57
33.00	0.3	6.0	6.0	0.1	3.85	0.11	0.72	1.62	4.53	65.00	14.35
33.00	0.3	6.0	6.0	0.1	3.85	0.03	0.72	1.06	4.20	65.00	15.47
30.00	0.3	6.0	6.0	0.1	4.89	0.03	0.72	1.03	5.18	65.00	12.55
27.50	0.3	6.0	6.0	0.1	5.63	0.03	0.72	1.01	5.89	65.00	11.04
25.00	0.3	6.0	6.0	0.0	6.24	0.03	0.72	1.00	6.48	65.00	10.02
22.50	0.3	5.9	5.9	0.0	6.78	0.03	0.72	0.98	6.97	65.00	9.33
20.00	0.3	5.9	5.9	0.0	7.62	0.03	0.72	0.97	7.78	65.00	8.36
20.00	0.3	5.9	5.9	0.0	7.62	0.04	0.72	1.08	7.73	65.00	8.41
17.50	0.3	5.8	5.8	0.0	6.48	0.04	0.72	1.11	6.63	65.00	9.80
15.00	0.3	5.6	5.6	0.0	5.27	0.04	0.72	1.15	5.48	65.00	11.86
12.50	0.3	5.5	5.5	0.0	4.00	0.04	0.72	1.18	4.30	65.00	15.12
10.00	0.3	5.3	5.3	0.0	2.65	0.04	0.72	1.21	3.16	65.00	20.57
7.00	0.3	5.1	5.2	0.0	2.06	0.04	0.72	1.25	2.95	65.00	22.01
7.00	0.3	5.1	5.2	0.0	2.06	0.12	0.72	1.78	3.62	65.00	17.96
5.00	0.3	5.0	5.0	0.0	3.44	0.12	0.72	1.80	4.20	65.00	15.48
2.50	0.3	4.9	4.9	0.0	6.93	0.12	0.72	1.83	7.09	65.00	9.17
0.00	0.3	4.7	4.7	0.0	10.55	0.12	0.72	1.86	10.68	65.00	6.09

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	4.7	4.7	0.0	11.08	0.10	0.72	1.88	11.21	65.00	5.80
37.50	0.3	4.9	4.9	0.1	7.27	0.10	0.72	1.85	7.41	65.00	8.77
35.00	0.3	5.0	5.0	0.1	3.52	0.10	0.72	1.83	4.29	65.00	15.17
33.00	0.3	5.1	5.2	0.1	1.72	0.10	0.72	1.80	3.51	65.00	18.52
33.00	0.3	5.1	5.2	0.1	1.72	0.02	0.72	1.25	2.73	65.00	23.82
30.00	0.3	5.3	5.3	0.1	2.56	0.02	0.72	1.21	3.07	65.00	21.15
27.50	0.3	5.5	5.5	0.1	3.88	0.02	0.72	1.19	4.24	65.00	15.33
25.00	0.3	5.6	5.6	0.1	5.09	0.02	0.72	1.17	5.37	65.00	12.11
22.50	0.3	5.8	5.8	0.0	6.18	0.02	0.72	1.15	6.41	65.00	10.14
20.00	0.3	5.9	5.9	0.0	7.58	0.02	0.72	1.12	7.70	65.00	8.45
20.00	0.3	5.9	5.9	0.0	7.58	0.05	0.72	0.90	7.77	65.00	8.37
17.50	0.3	5.9	5.9	0.0	7.03	0.05	0.72	0.93	7.23	65.00	8.99
15.00	0.3	6.0	6.0	0.0	6.40	0.05	0.72	0.97	6.63	65.00	9.80
12.50	0.3	6.0	6.0	0.0	5.71	0.05	0.72	1.00	5.97	65.00	10.88
10.00	0.3	6.0	6.0	0.0	4.95	0.05	0.72	1.04	5.26	65.00	12.37
7.00	0.3	6.0	6.0	0.0	3.94	0.05	0.72	1.08	4.33	65.00	15.02
7.00	0.3	6.0	6.0	0.0	3.94	0.13	0.72	1.60	4.44	65.00	14.63
5.00	0.3	6.0	6.0	0.0	2.22	0.13	0.72	1.62	3.57	65.00	18.23
2.50	0.3	6.0	6.0	0.0	2.74	0.13	0.72	1.65	3.91	65.00	16.63
0.00	0.3	6.0	6.0	0.0	5.76	0.13	0.72	1.68	6.16	65.00	10.55

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	3.4	3.4	0.0	0.42	0.11	1.40	1.74	3.03	65.00	21.43
37.50	0.2	3.4	3.4	0.0	0.78	0.11	1.40	1.71	2.98	65.00	21.78
35.00	0.2	3.4	3.4	0.1	1.67	0.11	1.40	1.67	3.17	65.00	20.49
33.00	0.2	3.3	3.4	0.1	2.30	0.11	1.40	1.64	3.56	65.00	18.27
33.00	0.2	3.3	3.4	0.1	2.30	0.11	0.92	1.06	2.89	65.00	22.46
30.00	0.2	3.3	3.3	0.1	2.81	0.11	0.92	1.02	3.32	65.00	19.56
27.50	0.2	3.3	3.3	0.1	3.10	0.11	0.92	0.99	3.58	65.00	18.17
25.00	0.2	3.3	3.3	0.1	3.27	0.11	0.92	0.95	3.73	65.00	17.43
22.50	0.2	3.2	3.2	0.1	3.33	0.11	0.92	0.94	3.77	65.00	17.23
20.00	0.2	3.2	3.2	0.1	3.26	0.11	0.92	0.96	3.71	65.00	17.53
20.00	0.2	3.2	3.2	0.1	3.26	0.11	0.43	0.60	3.41	65.00	19.04
17.50	0.2	3.1	3.1	0.1	2.83	0.11	0.43	0.63	2.99	65.00	21.75
15.00	0.2	3.1	3.1	0.1	2.28	0.11	0.43	0.66	2.45	65.00	26.56
12.50	0.2	3.0	3.0	0.1	1.76	0.11	0.43	0.69	2.03	65.00	32.03
10.00	0.2	2.9	2.9	0.0	1.56	0.11	0.43	0.72	1.91	65.00	34.05
7.00	0.2	2.8	2.8	0.0	2.03	0.11	0.43	0.76	2.29	65.00	28.44
7.00	0.2	2.8	2.8	0.0	2.02	0.11	0.05	0.50	2.25	65.00	28.88
5.00	0.2	2.8	2.8	0.0	2.86	0.11	0.05	0.53	2.98	65.00	21.81
2.50	0.2	2.7	2.7	0.0	4.50	0.11	0.05	0.56	4.62	65.00	14.08
0.00	0.2	2.6	2.6	0.0	6.23	0.11	0.05	0.59	6.35	65.00	10.24

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.6	2.6	0.0	2.01	0.08	0.05	0.44	2.09	65.00	31.09
37.50	0.2	2.7	2.7	0.0	1.18	0.08	0.05	0.41	1.33	65.00	48.78
35.00	0.2	2.8	2.8	0.1	1.17	0.08	0.05	0.37	1.33	65.00	48.96
33.00	0.2	2.8	2.8	0.1	1.79	0.08	0.05	0.34	1.87	65.00	34.70
33.00	0.2	2.8	2.8	0.1	1.78	0.08	0.43	0.64	2.14	65.00	30.43
30.00	0.2	2.9	2.9	0.1	2.23	0.08	0.43	0.60	2.52	65.00	25.78
27.50	0.2	3.0	3.0	0.1	2.50	0.08	0.43	0.57	2.76	65.00	23.59
25.00	0.2	3.1	3.1	0.1	2.83	0.08	0.43	0.54	3.03	65.00	21.44
22.50	0.2	3.1	3.1	0.1	3.11	0.08	0.43	0.52	3.30	65.00	19.69
20.00	0.2	3.2	3.2	0.1	3.27	0.08	0.43	0.50	3.46	65.00	18.81
20.00	0.2	3.2	3.2	0.1	3.27	0.08	0.92	1.09	3.84	65.00	16.94
17.50	0.2	3.2	3.3	0.1	3.06	0.08	0.92	1.11	3.66	65.00	17.74
15.00	0.2	3.3	3.3	0.1	2.74	0.08	0.92	1.13	3.39	65.00	19.15
12.50	0.2	3.3	3.3	0.1	2.48	0.08	0.92	1.15	3.25	65.00	20.03
10.00	0.2	3.3	3.3	0.0	2.53	0.08	0.92	1.18	3.31	65.00	19.61
7.00	0.2	3.3	3.4	0.0	2.64	0.08	0.92	1.21	3.37	65.00	19.31
7.00	0.2	3.3	3.4	0.0	2.64	0.08	1.40	1.82	4.09	65.00	15.91
5.00	0.2	3.4	3.4	0.0	3.46	0.08	1.40	1.85	4.63	65.00	14.03
2.50	0.2	3.4	3.4	0.0	4.50	0.08	1.40	1.87	5.50	65.00	11.81
0.00	0.2	3.4	3.4	0.0	5.64	0.08	1.40	1.90	6.44	65.00	10.09

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.6	1.6	0.0	1.91	0.04	0.75	1.12	2.45	65.00	26.49
37.50	0.1	1.6	1.6	0.0	0.76	0.04	0.75	1.09	1.98	65.00	32.78
35.00	0.1	1.6	1.6	0.0	0.63	0.04	0.75	1.05	1.92	65.00	33.89
33.00	0.1	1.6	1.6	0.1	1.33	0.04	0.75	1.02	2.04	65.00	31.84
33.00	0.1	1.6	1.6	0.1	1.33	0.04	0.61	0.80	1.88	65.00	34.51
30.00	0.1	1.6	1.6	0.1	1.80	0.04	0.61	0.76	2.23	65.00	29.17
27.50	0.1	1.6	1.6	0.1	2.11	0.04	0.61	0.72	2.45	65.00	26.50
25.00	0.1	1.6	1.6	0.1	2.42	0.04	0.61	0.69	2.70	65.00	24.08
22.50	0.1	1.6	1.6	0.1	2.62	0.04	0.61	0.66	2.88	65.00	22.54
20.00	0.1	1.6	1.6	0.1	2.70	0.04	0.61	0.64	2.96	65.00	21.96
20.00	0.1	1.6	1.6	0.1	2.70	0.04	0.47	0.60	2.93	65.00	22.22
17.50	0.1	1.5	1.5	0.1	2.42	0.04	0.47	0.63	2.67	65.00	24.33
15.00	0.1	1.5	1.5	0.1	2.03	0.04	0.47	0.66	2.32	65.00	28.06
12.50	0.1	1.5	1.5	0.0	1.54	0.04	0.47	0.69	1.98	65.00	32.82
10.00	0.1	1.4	1.4	0.0	1.43	0.04	0.47	0.72	1.92	65.00	33.79
7.00	0.1	1.4	1.4	0.0	1.74	0.04	0.47	0.76	2.17	65.00	29.93
7.00	0.1	1.4	1.4	0.0	1.74	0.04	0.33	0.72	2.10	65.00	30.92
5.00	0.1	1.3	1.3	0.0	2.39	0.04	0.33	0.75	2.70	65.00	24.08
2.50	0.1	1.3	1.3	0.0	3.81	0.04	0.33	0.78	3.92	65.00	16.57
0.00	0.1	1.2	1.2	0.0	5.37	0.04	0.33	0.81	5.46	65.00	11.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 2LC2 Extreme Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.2	1.2	0.0	1.79	0.08	0.33	0.69	1.91	65.00	34.02
37.50	0.1	1.3	1.3	0.0	0.73	0.08	0.33	0.66	1.26	65.00	51.71
35.00	0.1	1.3	1.3	0.0	0.75	0.08	0.33	0.62	1.22	65.00	53.08
33.00	0.1	1.4	1.4	0.1	1.43	0.08	0.33	0.60	1.56	65.00	41.58
33.00	0.1	1.4	1.4	0.1	1.43	0.08	0.47	0.65	1.71	65.00	38.12
30.00	0.1	1.4	1.4	0.1	1.89	0.08	0.47	0.61	2.07	65.00	31.38
27.50	0.1	1.5	1.5	0.1	2.16	0.08	0.47	0.58	2.38	65.00	27.32
25.00	0.1	1.5	1.5	0.1	2.46	0.08	0.47	0.55	2.66	65.00	24.42
22.50	0.1	1.5	1.5	0.1	2.64	0.08	0.47	0.52	2.83	65.00	22.94
20.00	0.1	1.6	1.6	0.1	2.71	0.08	0.47	0.50	2.89	65.00	22.47
20.00	0.1	1.6	1.6	0.1	2.71	0.08	0.61	0.75	2.92	65.00	22.28
17.50	0.1	1.6	1.6	0.1	2.42	0.08	0.61	0.77	2.66	65.00	24.43
15.00	0.1	1.6	1.6	0.1	2.01	0.08	0.61	0.80	2.32	65.00	28.07
12.50	0.1	1.6	1.6	0.0	1.52	0.08	0.61	0.83	2.04	65.00	31.89
10.00	0.1	1.6	1.6	0.0	1.41	0.08	0.61	0.87	1.99	65.00	32.59
7.00	0.1	1.6	1.6	0.0	1.77	0.08	0.61	0.90	2.25	65.00	28.89
7.00	0.1	1.6	1.6	0.0	1.77	0.08	0.75	1.15	2.51	65.00	25.94
5.00	0.1	1.6	1.6	0.0	2.43	0.08	0.75	1.18	3.02	65.00	21.53
2.50	0.1	1.6	1.6	0.0	3.90	0.08	0.75	1.21	4.15	65.00	15.67
0.00	0.1	1.6	1.6	0.0	5.48	0.08	0.75	1.24	5.67	65.00	11.47

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	420	2333	2371	1547
60.00	140	-25	142	0	421	2340	2378	1884
55.00	281	-51	285	0	421	2347	2385	2240
50.00	422	-76	429	0	422	2355	2392	2614
48.00	479	-86	486	0	422	2358	2396	2769
48.00	479	-86	486	0	422	2358	2395	2769
45.00	564	-101	573	0	423	2365	2403	3124
45.00	759	-474	894	1532	-2221	21159	21275	9970
40.00	2029	-340	2057	1532	-2248	21156	21275	10609
35.00	3298	-204	3305	1532	-2268	21151	21272	11278
32.00	4060	-123	4062	1532	-2267	21158	21279	11676
32.00	4020	-218	4026	1516	793	21800	21815	14741
30.00	4543	-237	4549	1516	793	21805	21820	15011
30.00	4543	-236	4550	1516	779	21790	21804	15601
25.00	5851	-282	5858	1516	762	21767	21780	16344
21.25	6831	-316	6838	1516	762	21774	21787	16885
21.25	6937	-338	6946	1444	2923	21859	22053	18707
20.00	7265	-381	7275	1444	2912	21829	22022	18929
15.00	8575	-554	8593	1444	2895	21781	21972	19746
10.00	9883	-727	9909	1444	2879	21726	21916	20592
5.00	11186	-898	11222	1444	2862	21665	21853	21468
0.00	12486	-1070	12532	1444	2862	21666	21854	22303

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	402	2347	2381	1531
60.00	141	-24	143	0	402	2356	2391	1868
55.00	283	-48	287	0	403	2366	2400	2224
50.00	425	-72	431	0	403	2376	2410	2598
48.00	482	-82	489	0	403	2381	2415	2752
48.00	482	-82	489	0	403	2380	2414	2753
45.00	568	-97	576	0	403	2390	2424	3107
45.00	179	395	434	-2	5275	35258	35651	19441
40.00	2295	78	2297	-2	5276	35247	35640	20102
35.00	4411	-238	4417	-2	5276	35228	35621	20806
32.00	5679	-428	5695	-2	5276	35238	35630	21204
32.00	4903	54	4904	-4	4710	34209	34532	29432
30.00	5725	-59	5725	-4	4711	34216	34538	29703
30.00	5725	-59	5725	-4	4710	34166	34489	30328
25.00	7775	-342	7782	-4	4707	34093	34416	31122
21.25	9309	-554	9326	-4	4707	34103	34426	31662
21.25	9003	-173	9005	-5	3917	33978	34203	36939
20.00	9513	-231	9516	-5	3915	33893	34119	37203
15.00	11547	-466	11556	-5	3909	33754	33980	38089
10.00	13572	-701	13590	-5	3902	33600	33826	39010
5.00	15588	-935	15617	-5	3892	33433	33659	39963
0.00	17595	-1168	17633	-5	3892	33435	33660	40798

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	384	2339	2370	1548
60.00	141	-23	142	0	384	2346	2378	1885
55.00	282	-46	285	0	384	2353	2385	2240
50.00	423	-69	429	0	384	2361	2392	2615
48.00	480	-78	486	0	385	2364	2395	2769
48.00	480	-78	486	0	384	2364	2395	2770
45.00	565	-92	572	0	385	2371	2402	3124
45.00	759	786	1093	-1536	7795	21189	22577	12033
40.00	2031	318	2056	-1536	7824	21177	22576	12671
35.00	3302	-153	3305	-1536	7844	21164	22571	13341
32.00	4064	-435	4087	-1536	7844	21172	22578	13738
32.00	4024	144	4026	-1521	5365	21811	22461	18822
30.00	4547	15	4547	-1521	5365	21816	22466	19093
30.00	4547	15	4547	-1521	5379	21790	22444	19682
25.00	5855	-309	5863	-1521	5394	21753	22412	20426
21.25	6834	-552	6856	-1521	5395	21761	22419	20966
21.25	6941	-146	6942	-1450	4028	21837	22206	24388
20.00	7268	-207	7271	-1450	4035	21794	22164	24611
15.00	8576	-450	8588	-1450	4046	21725	22099	25427
10.00	9880	-694	9904	-1450	4054	21649	22025	26273
5.00	11179	-939	11218	-1450	4058	21566	21945	27149
0.00	12473	-1182	12528	-1450	4058	21568	21946	27984

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-951	-470	1061	194	-7133	16434	17915	2709
37.50	-458	-258	525	194	-6995	16430	17857	2709
35.00	35	-50	61	194	-6873	16423	17803	2692
33.00	429	114	444	194	-6763	16420	17758	2692
33.00	429	114	444	194	-2188	4688	5173	4321
30.00	598	190	627	194	-2024	4678	5097	4327
27.50	738	249	779	194	-1887	4668	5035	4334
25.00	878	303	929	194	-1749	4657	4975	4342
22.50	1017	354	1077	194	-1611	4645	4917	4351
20.00	1157	400	1224	194	-1473	4642	4870	4351
20.00	1157	400	1224	194	3138	-7095	7759	5879
17.50	944	304	992	194	3276	-7099	7818	5879
15.00	730	204	758	194	3420	-7110	7890	5866
12.50	517	99	526	194	3562	-7119	7961	5856
10.00	303	-10	303	194	3707	-7127	8034	5845
7.00	47	-147	154	194	3872	-7131	8115	5845
7.00	47	-147	154	194	8512	-18854	20687	7311
5.00	-406	-352	537	194	8622	-18857	20735	7310
2.50	-971	-613	1149	194	8763	-18836	20774	7368
0.00	-1537	-878	1770	194	8901	-18839	20836	7368

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1532	-372	1577	-195	-6833	18804	20007	2607
37.50	-968	-169	983	-195	-6695	18801	19958	2607
35.00	-404	29	405	-195	-6550	18805	19913	2575
33.00	48	185	191	-195	-6433	18807	19877	2562
33.00	48	185	191	-195	-1796	7118	7341	4300
30.00	304	247	391	-195	-1626	7113	7296	4305
27.50	517	293	594	-195	-1483	7106	7259	4312
25.00	730	336	804	-195	-1340	7098	7223	4322
22.50	943	374	1015	-195	-1196	7088	7189	4334
20.00	1156	407	1226	-195	-1059	7085	7164	4334
20.00	1156	407	1226	-195	3554	-4635	5840	5999
17.50	1017	299	1060	-195	3691	-4638	5928	5999
15.00	877	186	897	-195	3830	-4654	6027	5989
12.50	737	69	740	-195	3967	-4668	6126	5981
10.00	597	-53	599	-195	4100	-4689	6229	5970
7.00	428	-203	474	-195	4265	-4694	6342	5969
7.00	428	-203	474	-195	8842	-16432	18660	7544
5.00	34	-417	418	-195	8952	-16435	18715	7544
2.50	-460	-687	827	-195	9062	-16441	18773	7574
0.00	-953	-961	1353	-195	9200	-16445	18843	7574

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	297	-107	316	388	-3082	-505	3123	-2495
37.50	282	-16	282	388	-2944	-508	2988	-2495
35.00	266	70	276	388	-2806	-514	2852	-2495
33.00	254	136	288	388	-2696	-517	2745	-2495
33.00	254	136	288	245	-716	-560	909	-2493
30.00	234	159	283	245	-551	-563	788	-2493
27.50	217	174	278	245	-414	-566	701	-2493
25.00	200	184	272	245	-277	-568	632	-2493
22.50	183	190	264	245	-140	-569	586	-2493
20.00	166	192	254	245	-3	-572	572	-2493
20.00	166	193	254	103	1976	-608	2068	-2495
17.50	147	132	198	103	2114	-611	2200	-2495
15.00	129	66	145	103	2251	-611	2333	-2496
12.50	111	-3	111	103	2389	-614	2466	-2496
10.00	92	-77	120	103	2527	-614	2600	-2496
7.00	70	-171	185	103	2692	-617	2762	-2497
7.00	70	-171	184	-40	4672	-651	4718	-2497
5.00	54	-284	289	-40	4783	-653	4827	-2497
2.50	35	-430	431	-40	4921	-656	4965	-2495
0.00	15	-579	580	-40	5061	-659	5103	-2491

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	16	-95	97	40	-3043	656	3113	-3072
37.50	36	-6	36	40	-2906	653	2978	-3072
35.00	55	79	96	40	-2768	651	2844	-3072
33.00	71	144	161	40	-2658	649	2737	-3071
33.00	71	143	160	-103	-679	614	916	-3069
30.00	93	165	189	-103	-514	611	799	-3068
27.50	111	178	210	-103	-378	609	717	-3068
25.00	130	188	228	-103	-241	608	653	-3068
22.50	148	193	243	-103	-104	606	615	-3068
20.00	166	194	255	-103	33	604	605	-3067
20.00	166	193	255	-245	2012	567	2090	-3069
17.50	183	131	225	-245	2149	564	2222	-3069
15.00	200	64	210	-245	2286	561	2354	-3069
12.50	217	-6	217	-245	2424	558	2488	-3069
10.00	233	-81	247	-245	2563	555	2622	-3068
7.00	253	-176	309	-245	2728	551	2783	-3069
7.00	253	-177	309	-388	4709	507	4736	-3069
5.00	265	-291	394	-388	4821	502	4847	-3066
2.50	280	-438	520	-388	4961	496	4986	-3062
0.00	295	-589	658	-388	5098	493	5122	-3062

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	108	-28	111	153	-1809	-36	1809	-1378
37.50	107	25	110	153	-1671	-39	1672	-1378
35.00	105	73	128	153	-1534	-42	1534	-1378
33.00	104	108	150	153	-1424	-44	1424	-1378
33.00	104	108	150	138	-424	-60	428	-1377
30.00	102	121	158	138	-259	-63	267	-1377
27.50	100	126	161	138	-122	-65	138	-1377
25.00	98	128	161	138	15	-67	68	-1377
22.50	96	125	158	138	153	-68	167	-1377
20.00	94	119	152	138	290	-70	299	-1377
20.00	94	119	152	122	1290	-85	1293	-1378
17.50	92	78	120	122	1427	-87	1430	-1378
15.00	89	33	95	122	1565	-88	1567	-1378
12.50	86	-16	88	122	1702	-90	1705	-1378
10.00	84	-69	108	122	1840	-91	1842	-1378
7.00	80	-138	160	122	2005	-92	2008	-1378
7.00	80	-138	160	107	3006	-105	3007	-1378
5.00	78	-212	226	107	3116	-106	3118	-1378
2.50	75	-307	316	107	3254	-107	3256	-1377
0.00	71	-407	413	107	3392	-108	3394	-1375

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	72	-22	75	-107	-1793	108	1796	-2171
37.50	75	30	81	-107	-1656	106	1659	-2171
35.00	78	77	110	-107	-1518	105	1522	-2170
33.00	81	112	138	-107	-1408	104	1412	-2170
33.00	81	112	138	-122	-409	91	419	-2169
30.00	84	124	150	-122	-244	89	259	-2169
27.50	87	129	156	-122	-107	87	138	-2169
25.00	89	130	158	-122	31	85	91	-2169
22.50	92	127	157	-122	168	84	187	-2169
20.00	94	120	153	-122	305	82	316	-2169
20.00	94	120	153	-138	1304	67	1306	-2170
17.50	96	79	125	-138	1442	65	1443	-2170
15.00	98	34	104	-138	1579	63	1580	-2170
12.50	100	-16	101	-138	1717	61	1718	-2170
10.00	102	-69	123	-138	1855	58	1856	-2170
7.00	104	-139	174	-138	2020	56	2021	-2170
7.00	104	-139	174	-153	3020	39	3020	-2170
5.00	105	-213	237	-153	3131	36	3131	-2169
2.50	106	-309	326	-153	3268	34	3269	-2169
0.00	107	-409	423	-153	3407	31	3407	-2167

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	12.2	12.2	0.1	0.00	0.09	0.00	0.27	0.48	65.00	99.90
60.00	0.8	10.8	10.8	0.1	1.37	0.10	0.00	0.26	1.47	65.00	44.23
55.00	0.7	9.4	9.5	0.1	2.47	0.12	0.00	0.25	2.58	65.00	25.18
50.00	0.6	8.1	8.1	0.1	3.35	0.13	0.00	0.24	3.48	65.00	18.67
48.00	0.5	7.6	7.6	0.1	3.66	0.13	0.00	0.23	3.79	65.00	17.14
48.00	0.5	7.6	7.6	0.1	2.47	0.09	0.00	0.16	2.56	65.00	25.35
45.00	0.5	6.8	6.8	0.1	2.75	0.10	0.00	0.15	2.85	65.00	22.80
45.00	0.5	6.8	6.8	0.1	4.21	0.31	3.61	4.94	9.28	65.00	7.01
40.00	0.4	5.5	5.5	0.0	9.02	0.32	3.29	4.57	11.38	65.00	5.71
35.00	0.3	4.3	4.3	0.0	13.07	0.32	3.02	4.24	14.68	65.00	4.43
32.00	0.3	3.7	3.7	0.0	15.17	0.33	2.87	4.07	16.52	65.00	3.93
32.00	0.3	3.7	3.7	0.0	15.12	0.41	2.84	4.07	16.44	65.00	3.95
30.00	0.2	3.2	3.3	0.0	16.52	0.41	2.75	3.96	17.72	65.00	3.67
30.00	0.2	3.2	3.3	0.0	16.52	0.43	2.75	3.96	17.74	65.00	3.66
25.00	0.2	2.3	2.3	0.0	19.62	0.43	2.54	3.70	20.63	65.00	3.15
21.25	0.1	1.7	1.7	0.0	21.60	0.43	2.40	3.52	22.50	65.00	2.89
21.25	0.1	1.7	1.7	0.0	21.95	0.48	2.28	3.41	22.82	65.00	2.85
20.00	0.1	1.5	1.5	0.0	22.57	0.48	2.24	3.36	23.42	65.00	2.78
15.00	0.1	0.8	0.8	0.0	24.82	0.48	2.08	3.16	25.59	65.00	2.54
10.00	0.0	0.4	0.4	0.0	26.69	0.49	1.94	2.97	27.41	65.00	2.37
5.00	0.0	0.1	0.1	0.0	28.24	0.49	1.81	2.81	28.92	65.00	2.25
0.00	0.0	0.0	0.0	0.0	29.52	0.49	1.69	2.66	30.18	65.00	2.15

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	16.3	16.3	0.2	0.00	0.09	0.00	0.27	0.48	65.00	99.90
60.00	0.7	14.5	14.5	0.2	1.37	0.10	0.00	0.26	1.47	65.00	44.08
55.00	0.6	12.7	12.7	0.2	2.48	0.11	0.00	0.25	2.59	65.00	25.08
50.00	0.5	11.0	11.0	0.1	3.37	0.13	0.00	0.24	3.50	65.00	18.59
48.00	0.5	10.3	10.3	0.1	3.68	0.13	0.00	0.23	3.81	65.00	17.06
48.00	0.5	10.3	10.3	0.1	2.49	0.09	0.00	0.16	2.58	65.00	25.23
45.00	0.4	9.2	9.2	0.1	2.77	0.10	0.00	0.15	2.87	65.00	22.68
45.00	0.4	9.2	9.2	0.1	2.06	0.61	0.00	2.24	4.71	65.00	13.79
40.00	0.4	7.5	7.5	0.1	9.86	0.60	0.00	2.14	10.56	65.00	6.15
35.00	0.3	5.9	5.9	0.1	17.45	0.59	0.00	2.05	18.05	65.00	3.60
32.00	0.3	5.0	5.0	0.1	21.48	0.59	0.00	2.00	22.07	65.00	2.94
32.00	0.3	5.0	5.0	0.1	18.23	0.82	0.01	1.94	19.10	65.00	3.40
30.00	0.2	4.5	4.5	0.0	20.59	0.81	0.01	1.91	21.41	65.00	3.04
30.00	0.2	4.5	4.5	0.0	20.59	0.83	0.01	1.90	21.42	65.00	3.03
25.00	0.2	3.2	3.2	0.0	26.04	0.82	0.01	1.83	26.86	65.00	2.42
21.25	0.1	2.3	2.3	0.0	29.54	0.81	0.01	1.77	30.35	65.00	2.14
21.25	0.1	2.3	2.3	0.0	28.26	0.95	0.01	1.77	29.21	65.00	2.23
20.00	0.1	2.1	2.1	0.0	29.34	0.94	0.01	1.75	30.29	65.00	2.15
15.00	0.1	1.2	1.2	0.0	33.20	0.93	0.01	1.68	34.14	65.00	1.90
10.00	0.0	0.5	0.5	0.0	36.44	0.92	0.01	1.61	37.36	65.00	1.74
5.00	0.0	0.1	0.1	0.0	39.14	0.91	0.01	1.55	40.05	65.00	1.62
0.00	0.0	0.0	0.0	0.0	41.39	0.90	0.01	1.50	42.29	65.00	1.54

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.6	12.2	12.2	0.1	0.00	0.09	0.00	0.27	0.48	65.00	99.90
60.00	0.6	10.8	10.8	0.1	1.37	0.10	0.00	0.26	1.47	65.00	44.29
55.00	0.5	9.4	9.5	0.1	2.46	0.12	0.00	0.25	2.58	65.00	25.22
50.00	0.5	8.1	8.1	0.1	3.35	0.13	0.00	0.24	3.48	65.00	18.70
48.00	0.5	7.6	7.6	0.1	3.65	0.13	0.00	0.23	3.79	65.00	17.17
48.00	0.5	7.6	7.6	0.1	2.47	0.09	0.00	0.15	2.56	65.00	25.39
45.00	0.4	6.8	6.8	0.1	2.75	0.10	0.00	0.15	2.85	65.00	22.83
45.00	0.4	6.8	6.8	0.1	5.27	0.38	3.62	5.04	10.21	65.00	6.37
40.00	0.4	5.5	5.5	0.1	9.00	0.38	3.30	4.66	11.76	65.00	5.53
35.00	0.3	4.3	4.3	0.0	13.03	0.38	3.03	4.33	14.64	65.00	4.44
32.00	0.3	3.7	3.7	0.0	15.50	0.38	2.88	4.15	16.71	65.00	3.89
32.00	0.3	3.7	3.7	0.0	15.06	0.52	2.85	4.12	16.70	65.00	3.89
30.00	0.2	3.2	3.3	0.0	16.32	0.52	2.76	4.01	17.82	65.00	3.65
30.00	0.2	3.2	3.3	0.0	16.32	0.54	2.76	4.00	17.84	65.00	3.64
25.00	0.2	2.3	2.3	0.0	19.65	0.54	2.55	3.74	20.66	65.00	3.15
21.25	0.1	1.7	1.7	0.0	21.80	0.54	2.40	3.57	22.72	65.00	2.86
21.25	0.1	1.7	1.7	0.0	21.80	0.62	2.29	3.44	22.74	65.00	2.86
20.00	0.1	1.5	1.5	0.0	22.44	0.62	2.25	3.38	23.37	65.00	2.78
15.00	0.1	0.8	0.8	0.0	24.74	0.62	2.09	3.18	25.60	65.00	2.54
10.00	0.0	0.4	0.4	0.0	26.65	0.62	1.94	2.99	27.46	65.00	2.37
5.00	0.0	0.1	0.1	0.0	28.25	0.62	1.82	2.82	29.02	65.00	2.24
0.00	0.0	0.0	0.0	0.0	29.56	0.62	1.70	2.67	30.31	65.00	2.14

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	9.2	9.2	0.1	16.84	0.18	1.49	3.98	17.20	65.00	3.78
37.50	0.4	9.3	9.3	0.2	8.30	0.18	1.49	3.97	8.85	65.00	7.34
35.00	0.4	9.3	9.3	0.2	0.94	0.18	1.49	3.96	6.96	65.00	9.34
33.00	0.4	9.3	9.3	0.3	7.00	0.18	1.49	3.96	8.06	65.00	8.07
33.00	0.4	9.3	9.3	0.3	7.00	0.29	1.49	2.21	7.75	65.00	8.38
30.00	0.4	9.4	9.4	0.3	9.94	0.29	1.49	2.20	10.56	65.00	6.16
27.50	0.4	9.3	9.4	0.4	12.36	0.29	1.49	2.19	12.91	65.00	5.03
25.00	0.4	9.3	9.3	0.4	14.75	0.30	1.49	2.18	15.26	65.00	4.26
22.50	0.4	9.2	9.2	0.4	17.11	0.30	1.49	2.17	17.58	65.00	3.70
20.00	0.4	9.1	9.1	0.4	19.44	0.30	1.49	2.16	19.89	65.00	3.27
20.00	0.4	9.1	9.1	0.4	19.44	0.40	1.49	2.57	20.00	65.00	3.25
17.50	0.4	8.9	8.9	0.4	15.72	0.40	1.49	2.57	16.32	65.00	3.98
15.00	0.4	8.6	8.6	0.3	11.98	0.40	1.49	2.58	12.62	65.00	5.15
12.50	0.4	8.3	8.3	0.3	8.20	0.40	1.49	2.59	8.94	65.00	7.27
10.00	0.4	8.0	8.0	0.2	4.52	0.40	1.49	2.60	5.78	65.00	11.24
7.00	0.4	7.6	7.6	0.1	2.44	0.40	1.49	2.61	4.96	65.00	13.11
7.00	0.4	7.6	7.6	0.1	2.44	0.50	1.49	4.37	7.81	65.00	8.33
5.00	0.4	7.4	7.4	0.1	8.11	0.50	1.49	4.37	9.32	65.00	6.97
2.50	0.4	7.1	7.1	0.1	18.01	0.50	1.49	4.38	18.72	65.00	3.47
0.00	0.4	6.8	6.8	0.1	27.93	0.50	1.49	4.38	28.57	65.00	2.27

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	6.8	6.8	0.1	24.79	0.18	1.49	4.28	25.08	65.00	2.59
37.50	0.5	7.1	7.1	0.1	15.26	0.18	1.49	4.27	15.62	65.00	4.16
35.00	0.5	7.4	7.4	0.2	6.12	0.18	1.49	4.26	8.54	65.00	7.61
33.00	0.5	7.6	7.6	0.3	3.01	0.17	1.49	4.26	7.84	65.00	8.29
33.00	0.5	7.6	7.6	0.3	3.01	0.29	1.49	2.52	5.26	65.00	12.36
30.00	0.5	8.0	8.0	0.3	5.97	0.29	1.49	2.51	7.03	65.00	9.24
27.50	0.5	8.3	8.3	0.4	9.39	0.29	1.49	2.51	10.11	65.00	6.43
25.00	0.5	8.6	8.6	0.4	12.78	0.29	1.49	2.50	13.40	65.00	4.85
22.50	0.5	8.9	8.9	0.4	16.14	0.29	1.49	2.50	16.70	65.00	3.89
20.00	0.4	9.1	9.1	0.4	19.47	0.29	1.49	2.49	19.99	65.00	3.25
20.00	0.4	9.1	9.1	0.4	19.47	0.41	1.49	2.31	20.10	65.00	3.23
17.50	0.4	9.2	9.2	0.4	16.76	0.41	1.49	2.32	17.43	65.00	3.73
15.00	0.4	9.3	9.3	0.3	14.03	0.41	1.49	2.33	14.74	65.00	4.41
12.50	0.4	9.3	9.4	0.3	11.26	0.41	1.49	2.35	12.05	65.00	5.39
10.00	0.4	9.4	9.4	0.2	9.09	0.41	1.49	2.36	10.28	65.00	6.32
7.00	0.4	9.3	9.3	0.2	7.53	0.41	1.49	2.38	8.87	65.00	7.33
7.00	0.4	9.3	9.3	0.2	7.53	0.51	1.49	4.08	10.08	65.00	6.45
5.00	0.4	9.3	9.3	0.1	6.33	0.51	1.49	4.09	9.84	65.00	6.60
2.50	0.4	9.3	9.3	0.1	12.90	0.52	1.49	4.10	14.46	65.00	4.49
0.00	0.4	9.2	9.2	0.1	19.93	0.52	1.49	4.11	21.14	65.00	3.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	5.0	5.0	0.1	5.02	0.17	2.97	3.41	7.55	65.00	8.61
37.50	0.3	5.0	5.0	0.1	4.24	0.17	2.97	3.39	7.08	65.00	9.18
35.00	0.3	5.0	5.0	0.1	4.34	0.17	2.97	3.37	7.16	65.00	9.08
33.00	0.3	5.0	5.0	0.1	4.56	0.17	2.97	3.35	7.27	65.00	8.94
33.00	0.3	5.0	5.0	0.1	4.57	0.17	1.88	2.00	5.63	65.00	11.55
30.00	0.3	4.9	4.9	0.2	4.41	0.17	1.88	1.99	5.52	65.00	11.78
27.50	0.3	4.8	4.9	0.2	4.25	0.17	1.88	1.98	5.40	65.00	12.03
25.00	0.3	4.8	4.8	0.2	4.06	0.17	1.88	1.97	5.27	65.00	12.34
22.50	0.3	4.7	4.7	0.2	3.91	0.17	1.88	1.96	5.13	65.00	12.66
20.00	0.3	4.6	4.6	0.2	3.84	0.17	1.88	1.96	5.08	65.00	12.79
20.00	0.3	4.6	4.6	0.2	3.85	0.17	0.79	1.07	4.25	65.00	15.28
17.50	0.3	4.5	4.5	0.2	2.97	0.17	0.79	1.09	3.61	65.00	18.03
15.00	0.3	4.4	4.4	0.1	2.30	0.17	0.79	1.11	3.06	65.00	21.24
12.50	0.3	4.3	4.3	0.1	1.65	0.17	0.79	1.13	2.67	65.00	24.37
10.00	0.3	4.2	4.2	0.1	1.83	0.17	0.79	1.15	2.81	65.00	23.11
7.00	0.3	4.0	4.0	0.0	2.94	0.17	0.79	1.17	3.57	65.00	18.21
7.00	0.3	4.0	4.0	0.0	2.93	0.17	0.31	0.96	3.10	65.00	20.94
5.00	0.3	3.9	3.9	0.0	4.51	0.17	0.31	0.98	4.68	65.00	13.90
2.50	0.3	3.8	3.8	0.0	6.53	0.17	0.31	1.00	6.70	65.00	9.71
0.00	0.3	3.7	3.7	0.0	8.61	0.17	0.31	1.02	8.78	65.00	7.41

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	3.7	3.7	0.0	1.50	0.21	0.30	0.74	1.71	65.00	37.93
37.50	0.3	3.8	3.8	0.1	0.56	0.21	0.30	0.72	1.29	65.00	50.31
35.00	0.3	3.9	3.9	0.1	1.50	0.21	0.30	0.70	1.76	65.00	37.02
33.00	0.3	4.0	4.0	0.1	2.55	0.21	0.30	0.69	2.79	65.00	23.29
33.00	0.3	4.0	4.0	0.1	2.54	0.21	0.79	0.92	3.04	65.00	21.40
30.00	0.3	4.2	4.2	0.2	2.99	0.21	0.79	0.90	3.44	65.00	18.87
27.50	0.3	4.3	4.3	0.2	3.30	0.21	0.79	0.89	3.73	65.00	17.43
25.00	0.3	4.4	4.4	0.2	3.55	0.21	0.79	0.88	3.96	65.00	16.42
22.50	0.3	4.5	4.5	0.2	3.73	0.21	0.79	0.87	4.13	65.00	15.73
20.00	0.3	4.6	4.6	0.2	3.86	0.21	0.79	0.87	4.25	65.00	15.29
20.00	0.3	4.6	4.6	0.2	3.85	0.21	1.88	2.17	5.11	65.00	12.72
17.50	0.3	4.7	4.7	0.2	3.49	0.21	1.88	2.19	5.01	65.00	12.97
15.00	0.3	4.8	4.8	0.1	3.33	0.21	1.88	2.21	4.93	65.00	13.18
12.50	0.3	4.9	4.9	0.1	3.22	0.21	1.88	2.23	4.86	65.00	13.37
10.00	0.3	4.9	4.9	0.1	3.93	0.21	1.88	2.25	5.30	65.00	12.27
7.00	0.3	5.0	5.0	0.1	4.80	0.21	1.88	2.27	5.97	65.00	10.89
7.00	0.3	5.0	5.0	0.1	4.80	0.21	2.97	3.63	7.67	65.00	8.47
5.00	0.3	5.0	5.0	0.0	5.89	0.21	2.97	3.65	8.25	65.00	7.88
2.50	0.3	5.0	5.0	0.0	8.14	0.21	2.97	3.67	9.65	65.00	6.74
0.00	0.3	5.0	5.0	0.1	10.45	0.21	2.97	3.68	11.68	65.00	5.56

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	2.3	2.3	0.0	1.75	0.09	1.17	1.43	2.94	65.00	22.08
37.50	0.1	2.3	2.3	0.0	1.72	0.09	1.17	1.41	2.90	65.00	22.38
35.00	0.1	2.3	2.3	0.1	1.99	0.09	1.17	1.39	3.04	65.00	21.36
33.00	0.1	2.3	2.3	0.1	2.23	0.09	1.17	1.37	3.15	65.00	20.61
33.00	0.1	2.3	2.3	0.1	2.23	0.09	1.05	1.11	2.92	65.00	22.25
30.00	0.1	2.3	2.3	0.1	2.39	0.09	1.05	1.09	3.06	65.00	21.21
27.50	0.1	2.2	2.2	0.1	2.47	0.09	1.05	1.07	3.13	65.00	20.77
25.00	0.1	2.2	2.2	0.1	2.48	0.09	1.05	1.06	3.15	65.00	20.66
22.50	0.1	2.2	2.2	0.1	2.43	0.09	1.05	1.08	3.11	65.00	20.88
20.00	0.1	2.1	2.1	0.1	2.32	0.09	1.05	1.10	3.03	65.00	21.44
20.00	0.1	2.1	2.1	0.1	2.32	0.09	0.94	1.12	2.96	65.00	21.94
17.50	0.1	2.1	2.1	0.1	1.82	0.09	0.94	1.13	2.72	65.00	23.90
15.00	0.1	2.0	2.1	0.1	1.51	0.09	0.94	1.15	2.53	65.00	25.66
12.50	0.1	2.0	2.0	0.0	1.37	0.09	0.94	1.17	2.48	65.00	26.18
10.00	0.1	1.9	1.9	0.0	1.65	0.09	0.94	1.19	2.68	65.00	24.23
7.00	0.1	1.9	1.9	0.0	2.52	0.09	0.94	1.22	3.19	65.00	20.38
7.00	0.1	1.9	1.9	0.0	2.52	0.09	0.82	1.24	3.13	65.00	20.79
5.00	0.1	1.8	1.8	0.0	3.59	0.09	0.82	1.25	4.06	65.00	15.99
2.50	0.1	1.7	1.7	0.0	4.97	0.09	0.82	1.27	5.35	65.00	12.14
0.00	0.1	1.7	1.7	0.0	6.42	0.09	0.82	1.29	6.74	65.00	9.64

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C1 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.7	1.7	0.0	1.19	0.15	0.82	1.07	2.26	65.00	28.72
37.50	0.1	1.7	1.7	0.0	1.29	0.15	0.82	1.05	2.28	65.00	28.51
35.00	0.1	1.8	1.8	0.1	1.62	0.15	0.82	1.03	2.48	65.00	26.17
33.00	0.1	1.9	1.9	0.1	2.14	0.15	0.82	1.01	2.75	65.00	23.63
33.00	0.1	1.9	1.9	0.1	2.14	0.15	0.94	0.99	2.82	65.00	23.08
30.00	0.1	1.9	1.9	0.1	2.34	0.15	0.94	0.97	2.97	65.00	21.91
27.50	0.1	2.0	2.0	0.1	2.43	0.15	0.94	0.95	3.04	65.00	21.39
25.00	0.1	2.0	2.1	0.1	2.46	0.15	0.94	0.95	3.06	65.00	21.24
22.50	0.1	2.1	2.1	0.1	2.43	0.15	0.94	0.96	3.03	65.00	21.46
20.00	0.1	2.1	2.1	0.1	2.34	0.15	0.94	0.98	2.95	65.00	22.05
20.00	0.1	2.1	2.1	0.1	2.34	0.15	1.05	1.24	3.01	65.00	21.59
17.50	0.1	2.2	2.2	0.1	1.90	0.15	1.05	1.26	2.78	65.00	23.42
15.00	0.1	2.2	2.2	0.1	1.65	0.15	1.05	1.27	2.65	65.00	24.52
12.50	0.1	2.2	2.2	0.1	1.57	0.15	1.05	1.29	2.62	65.00	24.80
10.00	0.1	2.3	2.3	0.0	1.92	0.15	1.05	1.31	2.85	65.00	22.79
7.00	0.1	2.3	2.3	0.0	2.68	0.15	1.05	1.34	3.27	65.00	19.87
7.00	0.1	2.3	2.3	0.0	2.68	0.15	1.17	1.59	3.50	65.00	18.57
5.00	0.1	2.3	2.3	0.0	3.77	0.15	1.17	1.61	4.29	65.00	15.14
2.50	0.1	2.3	2.3	0.0	5.18	0.15	1.17	1.63	5.61	65.00	11.59
0.00	0.1	2.3	2.3	0.0	6.66	0.15	1.17	1.65	7.02	65.00	9.25

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	609	2304	2384	468
60.00	138	-37	143	0	610	2309	2388	805
55.00	277	-73	287	0	610	2313	2392	1161
50.00	416	-110	430	0	610	2318	2397	1536
48.00	472	-124	488	0	610	2320	2399	1690
48.00	472	-124	488	0	610	2319	2398	1691
45.00	555	-146	574	0	611	2324	2403	2045
45.00	650	153	668	761	1863	11732	11879	313
40.00	1354	41	1355	761	1864	11739	11886	926
35.00	2059	-70	2060	761	1852	11746	11892	1587
32.00	2482	-136	2486	761	1852	11751	11896	1985
32.00	2352	-257	2366	751	242	12070	12072	5151
30.00	2642	-263	2655	751	242	12072	12075	5422
30.00	2642	-263	2655	751	239	12072	12075	5987
25.00	3366	-277	3378	751	234	12071	12073	6698
21.25	3910	-287	3920	751	234	12075	12077	7239
21.25	3950	-335	3964	715	2130	12124	12309	9151
20.00	4132	-367	4148	715	2127	12116	12301	9347
15.00	4859	-494	4884	715	2122	12104	12289	10119
10.00	5585	-621	5620	715	2117	12090	12274	10920
5.00	6311	-748	6355	715	2111	12072	12255	11749
0.00	7035	-874	7089	715	2112	12073	12256	12584

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	601	2308	2385	460
60.00	139	-36	143	0	601	2314	2391	797
55.00	278	-72	287	0	601	2320	2396	1153
50.00	417	-108	431	0	602	2325	2402	1528
48.00	473	-123	489	0	602	2328	2404	1682
48.00	473	-123	489	0	602	2327	2404	1683
45.00	557	-144	575	0	602	2333	2410	2037
45.00	367	306	478	-1	4500	18865	19395	305
40.00	1500	36	1500	-1	4501	18874	19403	935
35.00	2632	-234	2643	-1	4501	18882	19411	1596
32.00	3312	-396	3336	-1	4502	18887	19417	1994
32.00	2717	23	2717	-2	3935	18439	18854	10228
30.00	3159	-71	3160	-2	3935	18443	18858	10499
30.00	3159	-71	3160	-2	3935	18437	18852	11074
25.00	4266	-308	4277	-2	3935	18427	18842	11800
21.25	5095	-485	5118	-2	3935	18432	18848	12340
21.25	4921	-158	4924	-2	3259	18393	18679	17588
20.00	5197	-207	5201	-2	3258	18371	18658	17795
15.00	6300	-403	6312	-2	3256	18337	18624	18587
10.00	7400	-598	7424	-2	3253	18298	18585	19409
5.00	8498	-793	8535	-2	3249	18253	18540	20260
0.00	9593	-988	9644	-2	3249	18254	18541	21095

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	592	2309	2384	468
60.00	139	-36	143	0	593	2313	2388	805
55.00	278	-71	287	0	593	2318	2392	1161
50.00	417	-107	430	0	593	2322	2397	1535
48.00	473	-121	488	0	593	2324	2399	1690
48.00	473	-121	488	0	593	2324	2398	1691
45.00	556	-142	574	0	594	2328	2403	2045
45.00	651	22	651	-763	2640	11745	12039	2217
40.00	1356	-137	1363	-763	2648	11749	12044	2840
35.00	2061	-296	2082	-763	2653	11752	12048	3491
32.00	2484	-391	2515	-763	2654	11756	12052	3889
32.00	2354	150	2359	-753	4846	12075	13011	8802
30.00	2644	34	2644	-753	4846	12078	13013	9072
30.00	2644	34	2644	-753	4850	12073	13010	9638
25.00	3368	-258	3378	-753	4854	12064	13004	10350
21.25	3911	-476	3940	-753	4855	12068	13008	10890
21.25	3952	-99	3953	-718	3640	12114	12649	14170
20.00	4133	-154	4136	-718	3642	12100	12636	14366
15.00	4860	-373	4874	-718	3645	12078	12616	15139
10.00	5584	-592	5616	-718	3646	12053	12592	15940
5.00	6308	-811	6359	-718	3645	12025	12565	16769
0.00	7029	-1030	7104	-718	3645	12026	12566	17604

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-486	308	576	94	1820	8263	8461	-1524
37.50	-238	252	347	94	1955	8261	8489	-1528
35.00	9	191	191	94	2093	8259	8520	-1528
33.00	208	140	250	94	2201	8257	8546	-1529
33.00	208	140	250	94	909	2378	2546	-324
30.00	293	104	311	94	1074	2375	2607	-324
27.50	364	70	371	94	1211	2374	2665	-323
25.00	436	31	437	94	1348	2372	2728	-322
22.50	507	-11	507	94	1485	2371	2798	-320
20.00	578	-58	581	94	1622	2369	2871	-318
20.00	578	-58	581	94	339	-3516	3533	866
17.50	472	-70	477	94	477	-3519	3551	863
15.00	367	-86	377	94	615	-3521	3575	861
12.50	261	-107	282	94	753	-3523	3603	859
10.00	155	-131	203	94	892	-3525	3636	859
7.00	28	-167	169	94	1057	-3527	3682	859
7.00	28	-167	169	94	-221	-9417	9420	2026
5.00	-198	-163	256	94	-111	-9419	9419	2027
2.50	-480	-161	507	94	30	-9418	9418	2037
0.00	-763	-164	780	94	167	-9420	9421	2038

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-761	300	818	-95	1737	9407	9566	-1262
37.50	-479	245	538	-95	1876	9404	9589	-1270
35.00	-197	187	271	-95	2013	9402	9615	-1270
33.00	29	137	140	-95	2125	9400	9637	-1274
33.00	29	137	140	-95	848	3522	3623	-42
30.00	156	104	187	-95	1014	3520	3663	-41
27.50	261	71	271	-95	1152	3518	3702	-40
25.00	367	35	368	-95	1291	3515	3745	-38
22.50	472	-6	472	-95	1429	3513	3793	-35
20.00	578	-51	580	-95	1567	3511	3845	-35
20.00	578	-51	580	-95	283	-2368	2385	1182
17.50	507	-62	510	-95	421	-2370	2407	1182
15.00	435	-76	442	-95	558	-2373	2438	1180
12.50	364	-95	376	-95	695	-2376	2476	1179
10.00	293	-118	316	-95	832	-2379	2520	1177
7.00	207	-151	256	-95	996	-2383	2582	1176
7.00	207	-151	256	-95	-297	-8265	8270	2371
5.00	9	-145	145	-95	-187	-8267	8269	2371
2.50	-239	-142	278	-95	-54	-8268	8268	2375
0.00	-487	-142	508	-95	84	-8270	8270	2375

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	143	-141	201	298	-3237	-227	3245	2182
37.50	136	-46	144	298	-3099	-228	3108	2182
35.00	129	45	137	298	-2962	-235	2971	2182
33.00	124	115	169	298	-2852	-236	2861	2182
33.00	124	115	169	155	-871	-260	909	2185
30.00	114	144	184	155	-705	-263	753	2185
27.50	106	163	194	155	-567	-265	626	2185
25.00	99	178	203	155	-429	-267	505	2185
22.50	90	188	209	155	-290	-269	396	2185
20.00	82	195	212	155	-153	-270	310	2185
20.00	82	195	212	13	1828	-289	1851	2184
17.50	74	138	157	13	1965	-290	1987	2184
15.00	65	77	101	13	2104	-292	2124	2183
12.50	56	12	57	13	2241	-293	2261	2183
10.00	47	-57	74	13	2379	-295	2397	2183
7.00	37	-146	150	13	2544	-296	2561	2183
7.00	37	-145	150	-130	4523	-316	4534	2182
5.00	29	-255	257	-130	4632	-318	4643	2184
2.50	19	-396	397	-130	4768	-321	4779	2187
0.00	10	-541	542	-130	4906	-322	4917	2187

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	10	-121	121	130	-3159	320	3175	1607
37.50	20	-28	34	130	-3022	318	3039	1607
35.00	29	60	67	130	-2884	316	2901	1607
33.00	37	128	134	130	-2774	315	2792	1608
33.00	37	128	133	-13	-794	296	847	1610
30.00	48	154	161	-13	-628	294	694	1610
27.50	56	170	180	-13	-490	293	571	1611
25.00	65	183	194	-13	-352	291	457	1611
22.50	74	192	205	-13	-214	290	360	1611
20.00	83	196	213	-13	-76	288	298	1611
20.00	83	196	212	-155	1904	269	1923	1610
17.50	91	137	164	-155	2042	268	2059	1610
15.00	99	73	123	-155	2180	265	2196	1609
12.50	106	6	107	-155	2317	263	2332	1609
10.00	114	-66	132	-155	2455	259	2469	1609
7.00	124	-157	200	-155	2620	257	2633	1609
7.00	123	-157	200	-298	4600	232	4606	1608
5.00	129	-269	298	-298	4709	228	4715	1610
2.50	136	-412	434	-298	4846	223	4851	1614
0.00	142	-560	578	-298	4983	221	4988	1614

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	53	-56	77	87	-1931	-15	1931	-1220
37.50	53	0	53	87	-1793	-16	1793	-1220
35.00	52	52	73	87	-1656	-18	1656	-1219
33.00	52	90	104	87	-1546	-19	1546	-1219
33.00	52	90	104	71	-546	-28	546	-1219
30.00	51	107	118	71	-381	-29	382	-1218
27.50	50	116	126	71	-243	-30	245	-1218
25.00	49	121	131	71	-106	-32	111	-1218
22.50	48	122	131	71	31	-33	45	-1218
20.00	47	119	128	71	169	-34	172	-1218
20.00	47	119	128	56	1168	-42	1169	-1219
17.50	45	82	94	56	1306	-42	1307	-1219
15.00	44	41	60	56	1443	-43	1444	-1219
12.50	43	-4	43	56	1581	-44	1582	-1219
10.00	42	-54	68	56	1719	-45	1719	-1219
7.00	40	-119	125	56	1884	-46	1884	-1219
7.00	40	-119	125	40	2884	-53	2885	-1219
5.00	39	-189	193	40	2994	-54	2995	-1219
2.50	37	-281	283	40	3132	-55	3133	-1218
0.00	35	-377	379	40	3270	-55	3271	-1217

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	36	-48	60	-40	-1903	55	1903	-1899
37.50	37	7	38	-40	-1765	54	1766	-1898
35.00	39	58	70	-40	-1627	53	1628	-1898
33.00	40	96	104	-40	-1517	53	1518	-1898
33.00	40	96	104	-56	-518	45	520	-1897
30.00	42	111	119	-56	-353	44	355	-1897
27.50	43	120	128	-56	-215	43	220	-1897
25.00	44	124	132	-56	-79	42	89	-1897
22.50	46	125	133	-56	59	42	72	-1897
20.00	47	121	130	-56	196	40	200	-1897
20.00	47	121	130	-71	1196	32	1196	-1898
17.50	48	83	96	-71	1333	31	1333	-1898
15.00	49	41	64	-71	1471	30	1471	-1898
12.50	50	-5	50	-71	1608	29	1608	-1898
10.00	50	-56	75	-71	1746	27	1746	-1898
7.00	51	-121	132	-71	1911	26	1911	-1898
7.00	51	-121	132	-87	2911	17	2911	-1898
5.00	52	-193	199	-87	3021	16	3022	-1898
2.50	52	-285	290	-87	3160	14	3160	-1897
0.00	53	-382	386	-87	3298	12	3298	-1896

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	7.1	7.1	0.0	0.00	0.03	0.00	0.28	0.48	65.00	99.90
60.00	0.6	6.3	6.3	0.0	1.38	0.04	0.00	0.26	1.42	65.00	45.70
55.00	0.5	5.4	5.5	0.0	2.49	0.06	0.00	0.25	2.54	65.00	25.54
50.00	0.5	4.7	4.7	0.0	3.38	0.08	0.00	0.24	3.45	65.00	18.83
48.00	0.4	4.3	4.4	0.0	3.68	0.08	0.00	0.23	3.77	65.00	17.26
48.00	0.4	4.3	4.4	0.0	2.49	0.05	0.00	0.16	2.55	65.00	25.53
45.00	0.4	3.9	3.9	0.0	2.77	0.06	0.00	0.15	2.84	65.00	22.93
45.00	0.4	3.9	3.9	0.0	3.22	0.01	1.79	2.54	4.97	65.00	13.08
40.00	0.3	3.1	3.2	0.0	5.81	0.03	1.64	2.35	6.68	65.00	9.74
35.00	0.3	2.5	2.5	0.0	8.10	0.05	1.50	2.18	8.59	65.00	7.57
32.00	0.2	2.1	2.1	0.0	9.34	0.06	1.43	2.09	9.74	65.00	6.67
32.00	0.2	2.1	2.1	0.0	8.97	0.14	1.41	2.09	9.51	65.00	6.83
30.00	0.2	1.8	1.8	0.0	9.73	0.15	1.36	2.03	10.22	65.00	6.36
30.00	0.2	1.8	1.8	0.0	9.73	0.16	1.36	2.03	10.24	65.00	6.35
25.00	0.1	1.3	1.3	0.0	11.39	0.18	1.26	1.90	11.82	65.00	5.50
21.25	0.1	0.9	0.9	0.0	12.45	0.19	1.19	1.81	12.85	65.00	5.06
21.25	0.1	0.9	0.9	0.0	12.62	0.23	1.13	1.77	13.01	65.00	4.99
20.00	0.1	0.8	0.8	0.0	12.96	0.24	1.11	1.74	13.35	65.00	4.87
15.00	0.1	0.5	0.5	0.0	14.20	0.25	1.03	1.64	14.57	65.00	4.46
10.00	0.0	0.2	0.2	0.0	15.23	0.26	0.96	1.54	15.59	65.00	4.17
5.00	0.0	0.1	0.1	0.0	16.09	0.27	0.90	1.46	16.44	65.00	3.95
0.00	0.0	0.0	0.0	0.0	16.80	0.28	0.84	1.38	17.15	65.00	3.79

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	9.1	9.1	0.1	0.00	0.03	0.00	0.28	0.48	65.00	99.90
60.00	0.6	8.1	8.1	0.1	1.38	0.04	0.00	0.26	1.42	65.00	45.68
55.00	0.5	7.0	7.1	0.1	2.49	0.06	0.00	0.25	2.55	65.00	25.52
50.00	0.4	6.0	6.1	0.0	3.38	0.07	0.00	0.24	3.46	65.00	18.81
48.00	0.4	5.7	5.7	0.0	3.69	0.08	0.00	0.23	3.77	65.00	17.24
48.00	0.4	5.7	5.7	0.0	2.50	0.05	0.00	0.16	2.55	65.00	25.50
45.00	0.4	5.1	5.1	0.0	2.78	0.06	0.00	0.15	2.84	65.00	22.89
45.00	0.4	5.1	5.1	0.0	2.30	0.01	0.00	1.23	2.93	65.00	22.15
40.00	0.3	4.1	4.1	0.0	6.42	0.03	0.00	1.17	6.52	65.00	9.97
35.00	0.3	3.2	3.2	0.0	10.51	0.05	0.00	1.12	10.56	65.00	6.16
32.00	0.2	2.7	2.8	0.0	12.67	0.06	0.00	1.10	12.73	65.00	5.11
32.00	0.2	2.7	2.8	0.0	10.09	0.29	0.00	1.07	10.41	65.00	6.24
30.00	0.2	2.4	2.4	0.0	11.40	0.29	0.00	1.05	11.69	65.00	5.56
30.00	0.2	2.4	2.4	0.0	11.40	0.30	0.00	1.05	11.70	65.00	5.55
25.00	0.1	1.7	1.7	0.0	14.39	0.31	0.00	1.01	14.70	65.00	4.42
21.25	0.1	1.3	1.3	0.0	16.32	0.32	0.00	0.98	16.63	65.00	3.91
21.25	0.1	1.3	1.3	0.0	15.50	0.45	0.00	0.97	15.95	65.00	4.07
20.00	0.1	1.1	1.1	0.0	16.09	0.45	0.00	0.96	16.55	65.00	3.93
15.00	0.1	0.6	0.6	0.0	18.23	0.45	0.00	0.92	18.68	65.00	3.48
10.00	0.0	0.3	0.3	0.0	20.02	0.46	0.00	0.89	20.48	65.00	3.17
5.00	0.0	0.1	0.1	0.0	21.52	0.46	0.00	0.85	21.99	65.00	2.96
0.00	0.0	0.0	0.0	0.0	22.79	0.46	0.00	0.83	23.25	65.00	2.80

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	7.1	7.1	0.0	0.00	0.03	0.00	0.28	0.48	65.00	99.90
60.00	0.6	6.3	6.3	0.0	1.38	0.04	0.00	0.26	1.42	65.00	45.71
55.00	0.5	5.4	5.5	0.0	2.48	0.06	0.00	0.25	2.54	65.00	25.54
50.00	0.5	4.6	4.7	0.0	3.38	0.08	0.00	0.24	3.45	65.00	18.83
48.00	0.4	4.3	4.4	0.0	3.68	0.08	0.00	0.23	3.77	65.00	17.26
48.00	0.4	4.3	4.4	0.0	2.49	0.05	0.00	0.16	2.55	65.00	25.53
45.00	0.4	3.9	3.9	0.0	2.77	0.06	0.00	0.15	2.83	65.00	22.93
45.00	0.4	3.9	3.9	0.0	3.06	0.07	1.80	2.55	4.86	65.00	13.37
40.00	0.3	3.1	3.2	0.0	5.92	0.08	1.64	2.37	6.65	65.00	9.78
35.00	0.3	2.5	2.5	0.0	8.34	0.10	1.50	2.20	8.82	65.00	7.37
32.00	0.2	2.1	2.1	0.0	9.60	0.11	1.43	2.11	10.00	65.00	6.50
32.00	0.2	2.1	2.1	0.0	8.88	0.25	1.41	2.14	9.67	65.00	6.72
30.00	0.2	1.8	1.8	0.0	9.51	0.25	1.37	2.08	10.25	65.00	6.34
30.00	0.2	1.8	1.8	0.0	9.51	0.26	1.37	2.08	10.26	65.00	6.33
25.00	0.1	1.3	1.3	0.0	11.38	0.27	1.26	1.95	11.88	65.00	5.47
21.25	0.1	0.9	0.9	0.0	12.61	0.28	1.19	1.86	13.08	65.00	4.97
21.25	0.1	0.9	0.9	0.0	12.42	0.36	1.13	1.79	12.94	65.00	5.02
20.00	0.1	0.8	0.8	0.0	12.79	0.36	1.11	1.76	13.30	65.00	4.89
15.00	0.1	0.5	0.5	0.0	14.11	0.37	1.03	1.66	14.59	65.00	4.45
10.00	0.0	0.2	0.2	0.0	15.21	0.38	0.96	1.56	15.68	65.00	4.15
5.00	0.0	0.1	0.1	0.0	16.12	0.38	0.90	1.48	16.58	65.00	3.92
0.00	0.0	0.0	0.0	0.0	16.88	0.39	0.84	1.40	17.34	65.00	3.75

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	5.1	5.1	0.0	9.03	0.10	0.72	1.90	9.27	65.00	7.01
37.50	0.4	5.1	5.1	0.1	5.15	0.10	0.72	1.91	6.01	65.00	10.81
35.00	0.4	5.1	5.1	0.1	2.87	0.10	0.72	1.91	4.43	65.00	14.68
33.00	0.4	5.1	5.1	0.1	3.90	0.10	0.72	1.91	4.80	65.00	13.54
33.00	0.4	5.1	5.1	0.1	3.90	0.02	0.72	1.08	4.27	65.00	15.24
30.00	0.4	5.1	5.2	0.1	4.94	0.02	0.72	1.09	5.25	65.00	12.38
27.50	0.4	5.1	5.1	0.0	5.78	0.02	0.72	1.09	6.06	65.00	10.73
25.00	0.4	5.1	5.1	0.0	6.59	0.02	0.72	1.10	6.85	65.00	9.49
22.50	0.4	5.1	5.1	0.0	7.52	0.02	0.72	1.11	7.66	65.00	8.49
20.00	0.4	5.0	5.0	0.0	8.84	0.02	0.72	1.12	8.98	65.00	7.24
20.00	0.4	5.0	5.0	0.0	8.84	0.06	0.72	1.21	8.94	65.00	7.27
17.50	0.4	4.9	4.9	0.0	7.37	0.06	0.72	1.22	7.50	65.00	8.67
15.00	0.4	4.8	4.8	0.0	5.92	0.06	0.72	1.22	6.10	65.00	10.65
12.50	0.4	4.6	4.7	0.0	4.49	0.06	0.72	1.23	4.76	65.00	13.65
10.00	0.4	4.5	4.5	0.0	3.08	0.06	0.72	1.23	3.55	65.00	18.33
7.00	0.4	4.3	4.3	0.0	2.62	0.06	0.72	1.23	3.34	65.00	19.48
7.00	0.4	4.3	4.3	0.0	2.62	0.14	0.72	2.04	4.22	65.00	15.40
5.00	0.4	4.2	4.2	0.0	3.90	0.14	0.72	2.04	4.82	65.00	13.48
2.50	0.4	4.0	4.0	0.0	8.04	0.14	0.72	2.04	8.19	65.00	7.94
0.00	0.4	3.9	3.9	0.0	12.21	0.14	0.72	2.04	12.36	65.00	5.26

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	3.9	3.9	0.0	13.01	0.09	0.73	2.06	13.12	65.00	4.96
37.50	0.4	4.0	4.0	0.0	8.53	0.09	0.73	2.06	8.66	65.00	7.51
35.00	0.4	4.2	4.2	0.1	4.03	0.09	0.73	2.07	4.99	65.00	13.01
33.00	0.4	4.3	4.3	0.1	2.20	0.09	0.73	2.07	4.13	65.00	15.74
33.00	0.4	4.3	4.3	0.1	2.20	0.00	0.73	1.23	3.05	65.00	21.30
30.00	0.4	4.5	4.5	0.1	2.92	0.00	0.73	1.24	3.43	65.00	18.92
27.50	0.4	4.6	4.7	0.0	4.28	0.00	0.73	1.24	4.65	65.00	13.97
25.00	0.4	4.8	4.8	0.0	5.60	0.00	0.73	1.25	5.91	65.00	11.01
22.50	0.4	4.9	4.9	0.0	6.98	0.00	0.73	1.26	7.16	65.00	9.08
20.00	0.4	5.0	5.0	0.0	8.80	0.00	0.73	1.26	8.89	65.00	7.31
20.00	0.4	5.0	5.0	0.0	8.80	0.08	0.73	1.06	9.01	65.00	7.21
17.50	0.4	5.1	5.1	0.0	7.82	0.08	0.73	1.06	8.06	65.00	8.07
15.00	0.4	5.1	5.1	0.0	6.86	0.08	0.73	1.07	7.13	65.00	9.12
12.50	0.4	5.1	5.1	0.0	5.93	0.08	0.73	1.07	6.23	65.00	10.43
10.00	0.4	5.1	5.2	0.0	5.02	0.08	0.73	1.08	5.37	65.00	12.11
7.00	0.4	5.1	5.1	0.0	3.96	0.08	0.73	1.09	4.39	65.00	14.82
7.00	0.4	5.1	5.1	0.0	3.96	0.16	0.73	1.88	4.76	65.00	13.64
5.00	0.4	5.1	5.1	0.0	2.19	0.16	0.73	1.88	3.99	65.00	16.31
2.50	0.4	5.1	5.1	0.0	4.38	0.16	0.73	1.88	4.98	65.00	13.06
0.00	0.4	5.1	5.1	0.0	8.03	0.16	0.73	1.88	8.43	65.00	7.71

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.7	2.8	0.0	2.96	0.15	2.28	2.73	5.60	65.00	11.62
37.50	0.2	2.7	2.7	0.0	2.28	0.15	2.28	2.71	5.22	65.00	12.45
35.00	0.2	2.7	2.7	0.1	2.18	0.15	2.28	2.70	5.18	65.00	12.54
33.00	0.2	2.7	2.7	0.1	2.52	0.15	2.28	2.68	5.33	65.00	12.21
33.00	0.2	2.7	2.7	0.1	2.52	0.15	1.19	1.32	3.51	65.00	18.52
30.00	0.2	2.7	2.7	0.1	2.81	0.15	1.19	1.29	3.67	65.00	17.69
27.50	0.2	2.7	2.7	0.2	3.04	0.15	1.19	1.28	3.86	65.00	16.85
25.00	0.2	2.6	2.6	0.2	3.21	0.15	1.19	1.26	3.99	65.00	16.28
22.50	0.2	2.6	2.6	0.2	3.32	0.15	1.19	1.24	4.08	65.00	15.93
20.00	0.2	2.5	2.5	0.2	3.37	0.15	1.19	1.23	4.11	65.00	15.80
20.00	0.2	2.5	2.5	0.2	3.37	0.15	0.10	0.35	3.52	65.00	18.46
17.50	0.2	2.5	2.5	0.1	2.48	0.15	0.10	0.37	2.63	65.00	24.70
15.00	0.2	2.4	2.4	0.1	1.53	0.15	0.10	0.39	1.68	65.00	38.67
12.50	0.2	2.4	2.4	0.1	0.90	0.15	0.10	0.41	1.09	65.00	59.60
10.00	0.2	2.3	2.3	0.1	1.13	0.15	0.10	0.43	1.28	65.00	50.71
7.00	0.2	2.3	2.3	0.0	2.37	0.15	0.10	0.45	2.52	65.00	25.82
7.00	0.2	2.3	2.3	0.0	2.36	0.15	1.00	1.63	3.34	65.00	19.43
5.00	0.2	2.2	2.2	0.0	3.93	0.15	1.00	1.64	4.64	65.00	14.00
2.50	0.2	2.1	2.2	0.0	5.94	0.15	1.00	1.66	6.49	65.00	10.01
0.00	0.2	2.1	2.1	0.0	8.02	0.15	1.00	1.68	8.47	65.00	7.67

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.1	2.1	0.0	1.84	0.11	0.99	1.44	2.85	65.00	22.78
37.50	0.2	2.1	2.2	0.0	0.53	0.11	0.99	1.42	2.50	65.00	25.98
35.00	0.2	2.2	2.2	0.1	1.07	0.11	0.99	1.40	2.51	65.00	25.93
33.00	0.2	2.3	2.3	0.1	2.11	0.11	0.99	1.38	2.93	65.00	22.20
33.00	0.2	2.3	2.3	0.1	2.11	0.11	0.10	0.22	2.22	65.00	29.24
30.00	0.2	2.3	2.3	0.1	2.55	0.11	0.10	0.19	2.66	65.00	24.40
27.50	0.2	2.4	2.4	0.2	2.85	0.11	0.10	0.18	2.96	65.00	21.92
25.00	0.2	2.4	2.4	0.2	3.09	0.11	0.10	0.16	3.20	65.00	20.28
22.50	0.2	2.5	2.5	0.2	3.27	0.11	0.10	0.15	3.38	65.00	19.21
20.00	0.2	2.5	2.5	0.2	3.38	0.11	0.10	0.14	3.50	65.00	18.57
20.00	0.2	2.5	2.5	0.2	3.38	0.11	1.19	1.46	4.18	65.00	15.56
17.50	0.2	2.6	2.6	0.1	2.56	0.11	1.19	1.48	3.53	65.00	18.42
15.00	0.2	2.6	2.6	0.1	1.89	0.11	1.19	1.50	3.26	65.00	19.94
12.50	0.2	2.7	2.7	0.1	1.60	0.11	1.19	1.51	3.12	65.00	20.83
10.00	0.2	2.7	2.7	0.1	2.08	0.11	1.19	1.53	3.39	65.00	19.19
7.00	0.2	2.7	2.7	0.0	3.06	0.11	1.19	1.56	3.90	65.00	16.65
7.00	0.2	2.7	2.7	0.0	3.06	0.11	2.28	2.92	5.73	65.00	11.34
5.00	0.2	2.7	2.7	0.0	4.74	0.11	2.28	2.94	6.51	65.00	9.99
2.50	0.2	2.7	2.7	0.0	6.89	0.11	2.28	2.96	8.24	65.00	7.89
0.00	0.2	2.7	2.8	0.0	9.10	0.11	2.28	2.98	10.19	65.00	6.38

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.3	1.3	0.0	1.15	0.08	0.67	0.94	1.89	65.00	34.36
37.50	0.1	1.3	1.3	0.0	0.77	0.08	0.67	0.92	1.73	65.00	37.56
35.00	0.1	1.3	1.3	0.1	1.08	0.08	0.67	0.90	1.82	65.00	35.70
33.00	0.1	1.2	1.3	0.1	1.64	0.08	0.67	0.88	2.03	65.00	32.07
33.00	0.1	1.2	1.3	0.1	1.64	0.08	0.55	0.62	1.94	65.00	33.55
30.00	0.1	1.2	1.2	0.1	1.88	0.08	0.55	0.60	2.16	65.00	30.11
27.50	0.1	1.2	1.2	0.1	2.01	0.08	0.55	0.58	2.28	65.00	28.45
25.00	0.1	1.2	1.2	0.1	2.08	0.08	0.55	0.56	2.35	65.00	27.60
22.50	0.1	1.2	1.2	0.1	2.09	0.08	0.55	0.55	2.37	65.00	27.43
20.00	0.1	1.2	1.2	0.1	2.04	0.08	0.55	0.57	2.33	65.00	27.91
20.00	0.1	1.2	1.2	0.1	2.04	0.08	0.43	0.59	2.28	65.00	28.46
17.50	0.1	1.2	1.2	0.1	1.49	0.08	0.43	0.61	1.79	65.00	36.37
15.00	0.1	1.1	1.1	0.1	0.90	0.08	0.43	0.63	1.45	65.00	44.98
12.50	0.1	1.1	1.1	0.0	0.66	0.08	0.43	0.65	1.33	65.00	48.73
10.00	0.1	1.1	1.1	0.0	1.04	0.08	0.43	0.67	1.52	65.00	42.70
7.00	0.1	1.0	1.0	0.0	1.99	0.08	0.43	0.69	2.27	65.00	28.67
7.00	0.1	1.0	1.0	0.0	1.99	0.08	0.31	0.71	2.22	65.00	29.23
5.00	0.1	1.0	1.0	0.0	3.01	0.08	0.31	0.73	3.21	65.00	20.28
2.50	0.1	1.0	1.0	0.0	4.36	0.08	0.31	0.75	4.52	65.00	14.39
0.00	0.1	0.9	0.9	0.0	5.76	0.08	0.31	0.77	5.90	65.00	11.01

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 3C2 Extreme Ice

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.9	0.9	0.0	0.92	0.13	0.31	0.58	1.35	65.00	48.14
37.50	0.1	1.0	1.0	0.0	0.59	0.13	0.31	0.56	1.18	65.00	55.04
35.00	0.1	1.0	1.0	0.1	1.09	0.13	0.31	0.54	1.39	65.00	46.64
33.00	0.1	1.0	1.0	0.1	1.65	0.13	0.31	0.52	1.90	65.00	34.17
33.00	0.1	1.0	1.0	0.1	1.65	0.13	0.43	0.50	1.94	65.00	33.42
30.00	0.1	1.1	1.1	0.1	1.89	0.13	0.43	0.48	2.16	65.00	30.07
27.50	0.1	1.1	1.1	0.1	2.03	0.13	0.43	0.46	2.28	65.00	28.47
25.00	0.1	1.1	1.1	0.1	2.10	0.13	0.43	0.44	2.35	65.00	27.69
22.50	0.1	1.2	1.2	0.1	2.11	0.13	0.43	0.44	2.36	65.00	27.60
20.00	0.1	1.2	1.2	0.1	2.06	0.13	0.43	0.46	2.30	65.00	28.20
20.00	0.1	1.2	1.2	0.1	2.06	0.13	0.55	0.71	2.34	65.00	27.74
17.50	0.1	1.2	1.2	0.1	1.51	0.13	0.55	0.73	1.83	65.00	35.48
15.00	0.1	1.2	1.2	0.1	0.97	0.13	0.55	0.75	1.53	65.00	42.56
12.50	0.1	1.2	1.2	0.0	0.76	0.13	0.55	0.77	1.47	65.00	44.36
10.00	0.1	1.2	1.2	0.0	1.12	0.13	0.55	0.79	1.64	65.00	39.67
7.00	0.1	1.2	1.3	0.0	2.10	0.13	0.55	0.81	2.36	65.00	27.55
7.00	0.1	1.2	1.3	0.0	2.10	0.13	0.67	1.07	2.43	65.00	26.78
5.00	0.1	1.3	1.3	0.0	3.15	0.13	0.67	1.09	3.39	65.00	19.16
2.50	0.1	1.3	1.3	0.0	4.51	0.13	0.67	1.11	4.72	65.00	13.77
0.00	0.1	1.3	1.3	0.0	5.94	0.13	0.67	1.13	6.13	65.00	10.61

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	745	2531	2639	1516
60.00	152	-48	159	0	801	2538	2661	1822
55.00	305	-98	320	0	860	2544	2685	2146
50.00	457	-151	482	0	922	2550	2712	2487
48.00	519	-173	547	0	948	2553	2723	2627
48.00	519	-173	547	0	947	2553	2723	2628
45.00	611	-208	645	0	987	2560	2743	2950
45.00	811	-432	919	1562	-1041	21691	21716	9108
40.00	2112	-371	2145	1562	-1002	21689	21712	9693
35.00	3414	-312	3428	1562	-952	21685	21706	10306
32.00	4195	-279	4204	1562	-908	21692	21711	10668
32.00	4201	-190	4205	1545	2540	22299	22444	12535
30.00	4736	-252	4743	1545	2570	22304	22451	12781
30.00	4736	-253	4743	1545	2681	22291	22451	13260
25.00	6074	-415	6088	1545	2739	22272	22439	13943
21.25	7076	-540	7097	1545	2799	22278	22454	14434
21.25	7189	-430	7202	1471	5066	22359	22926	15521
20.00	7525	-505	7542	1471	5075	22334	22903	15730
15.00	8865	-811	8902	1471	5139	22295	22880	16482
10.00	10203	-1120	10264	1471	5206	22250	22850	17263
5.00	11538	-1434	11627	1471	5276	22198	22816	18070
0.00	12870	-1753	12989	1471	5367	22199	22839	18829

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	725	2548	2649	1498
60.00	153	-46	160	0	780	2557	2673	1805
55.00	307	-95	321	0	839	2566	2699	2128
50.00	461	-147	484	0	901	2575	2728	2469
48.00	523	-169	550	0	926	2579	2741	2609
48.00	523	-169	550	0	926	2579	2740	2610
45.00	616	-203	649	0	966	2588	2762	2932
45.00	219	556	597	-1	7529	35992	36772	19017
40.00	2379	102	2381	-2	7599	35980	36774	19625
35.00	4538	-356	4552	-2	7668	35959	36768	20275
32.00	5833	-633	5867	-2	7713	35969	36786	20636
32.00	5131	103	5132	-5	7017	34881	35580	27523
30.00	5968	-66	5968	-5	7047	34887	35592	27769
30.00	5968	-68	5968	-5	7172	34837	35567	28285
25.00	8059	-500	8074	-5	7244	34765	35512	29023
21.25	9623	-828	9659	-5	7304	34775	35534	29514
21.25	9318	-236	9321	-6	6229	34640	35196	34187
20.00	9838	-330	9843	-6	6246	34560	35120	34439
15.00	11912	-707	11933	-6	6321	34427	35002	35265
10.00	13977	-1089	14020	-6	6395	34280	34871	36123
5.00	16034	-1475	16102	-6	6469	34120	34728	37012
0.00	18082	-1866	18178	-6	6560	34122	34747	37771

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	705	2542	2638	1517
60.00	153	-45	159	0	761	2550	2661	1823
55.00	306	-93	320	0	819	2557	2685	2147
50.00	460	-144	482	0	881	2564	2711	2487
48.00	521	-165	547	0	906	2567	2723	2628
48.00	521	-165	547	0	906	2567	2722	2628
45.00	614	-198	645	0	945	2574	2743	2951
45.00	811	807	1145	-1565	8468	21732	23323	12298
40.00	2116	296	2136	-1565	8566	21717	23345	12882
35.00	3419	-220	3426	-1565	8656	21702	23365	13495
32.00	4200	-533	4234	-1565	8700	21710	23388	13857
32.00	4205	117	4207	-1551	6455	22396	23308	18805
30.00	4743	-38	4743	-1551	6485	22401	23321	19051
30.00	4743	-40	4743	-1551	6625	22372	23332	19529
25.00	6085	-441	6101	-1551	6716	22332	23320	20214
21.25	7090	-745	7129	-1551	6776	22339	23345	20705
21.25	7202	-258	7207	-1478	6014	22421	23214	24258
20.00	7539	-349	7547	-1478	6041	22376	23177	24467
15.00	8881	-715	8910	-1478	6133	22303	23131	25219
10.00	10220	-1087	10277	-1478	6223	22223	23078	26000
5.00	11553	-1465	11645	-1478	6313	22138	23020	26808
0.00	12881	-1846	13013	-1478	6405	22139	23047	27567

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-964	-326	1017	197	-6444	16702	17902	1616
37.50	-463	-135	482	197	-6319	16698	17854	1616
35.00	38	53	66	197	-6208	16691	17808	1602
33.00	439	201	483	197	-6108	16688	17771	1602
33.00	439	201	483	197	-1551	4753	5000	3632
30.00	610	254	661	197	-1402	4744	4947	3639
27.50	752	295	808	197	-1277	4735	4905	3645
25.00	894	331	953	197	-1152	4726	4864	3653
22.50	1036	364	1098	197	-1027	4716	4826	3662
20.00	1177	393	1241	197	-902	4712	4798	3662
20.00	1177	393	1241	197	3695	-7230	8120	5586
17.50	960	280	1000	197	3820	-7234	8180	5586
15.00	743	164	761	197	3951	-7245	8252	5572
12.50	525	43	527	197	4081	-7253	8322	5562
10.00	308	-81	318	197	4212	-7261	8394	5552
7.00	46	-235	240	197	4362	-7265	8474	5551
7.00	46	-235	240	197	8987	-19196	21196	7414
5.00	-415	-452	614	197	9087	-19199	21241	7414
2.50	-990	-727	1228	197	9214	-19177	21275	7478
0.00	-1566	-1005	1861	197	9339	-19180	21333	7478

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1562	-224	1578	-200	-6143	19140	20102	1991
37.50	-987	-41	988	-200	-6018	19138	20062	1992
35.00	-413	137	435	-200	-5885	19141	20026	1959
33.00	46	277	281	-200	-5777	19143	19996	1947
33.00	46	277	281	-200	-1154	7255	7346	4091
30.00	307	316	441	-200	-998	7250	7318	4095
27.50	525	344	628	-200	-867	7244	7296	4103
25.00	742	368	829	-200	-737	7236	7274	4112
22.50	959	388	1035	-200	-606	7227	7252	4124
20.00	1176	404	1244	-200	-481	7224	7240	4124
20.00	1176	404	1244	-200	4117	-4697	6247	6191
17.50	1035	279	1072	-200	4243	-4701	6332	6191
15.00	894	150	906	-200	4368	-4716	6429	6180
12.50	752	16	752	-200	4491	-4741	6530	6166
10.00	610	-120	621	-200	4616	-4744	6620	6165
7.00	438	-289	525	-200	4762	-4758	6732	6161
7.00	438	-289	525	-200	9322	-16702	19127	8137
5.00	38	-514	515	-200	9422	-16704	19179	8137
2.50	-464	-798	923	-200	9515	-16710	19229	8171
0.00	-965	-1085	1452	-200	9640	-16713	19294	8171

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	306	77	315	350	-1879	-578	1966	-2508
37.50	288	132	317	350	-1754	-581	1848	-2508
35.00	271	183	327	350	-1629	-584	1731	-2508
33.00	257	221	339	350	-1530	-586	1638	-2507
33.00	263	221	344	235	69	-622	626	-2425
30.00	241	216	323	235	219	-626	663	-2425
27.50	222	207	304	235	344	-627	715	-2425
25.00	203	195	282	235	468	-629	784	-2425
22.50	184	179	257	235	593	-630	866	-2426
20.00	165	160	230	235	718	-632	956	-2426
20.00	172	160	234	120	2317	-663	2410	-2347
17.50	152	88	175	120	2442	-665	2531	-2347
15.00	132	13	132	120	2567	-666	2652	-2348
12.50	112	-66	129	120	2692	-668	2774	-2348
10.00	92	-148	174	120	2818	-670	2896	-2348
7.00	67	-252	261	120	2969	-672	3044	-2347
7.00	74	-252	263	5	4570	-701	4623	-2265
5.00	57	-363	367	5	4670	-703	4722	-2265
2.50	36	-505	506	5	4796	-705	4848	-2263
0.00	15	-651	651	5	4923	-707	4974	-2259

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	17	88	90	-6	-1845	619	1946	-3460
37.50	35	141	146	-6	-1720	617	1827	-3460
35.00	54	191	199	-6	-1596	615	1710	-3459
33.00	69	228	238	-6	-1496	614	1617	-3458
33.00	75	228	240	-121	102	585	594	-3375
30.00	96	221	241	-121	252	582	634	-3375
27.50	114	212	240	-121	376	580	692	-3375
25.00	131	199	238	-121	500	579	765	-3375
22.50	148	182	235	-121	624	577	850	-3375
20.00	166	161	231	-121	748	575	944	-3375
20.00	172	161	235	-236	2347	544	2410	-3295
17.50	188	88	208	-236	2473	541	2531	-3295
15.00	204	12	205	-236	2597	539	2653	-3296
12.50	221	-67	231	-236	2723	535	2776	-3295
10.00	237	-151	281	-236	2850	533	2899	-3294
7.00	256	-256	362	-236	3000	529	3046	-3294
7.00	262	-257	367	-351	4601	492	4627	-3212
5.00	274	-368	459	-351	4701	490	4727	-3212
2.50	288	-511	587	-351	4829	485	4853	-3209
0.00	303	-658	724	-351	4957	479	4980	-3204

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	111	103	151	152	-1072	-50	1073	-987
37.50	109	133	172	152	-947	-52	949	-987
35.00	107	160	193	152	-822	-55	824	-987
33.00	106	178	207	152	-722	-56	724	-986
33.00	107	177	207	139	141	-71	158	-915
30.00	105	169	199	139	291	-73	300	-915
27.50	102	159	189	139	416	-75	423	-915
25.00	100	145	176	139	541	-77	546	-915
22.50	98	126	160	139	666	-78	670	-916
20.00	95	105	141	139	791	-80	795	-916
20.00	96	103	141	125	1655	-93	1657	-846
17.50	94	52	107	125	1780	-95	1782	-846
15.00	91	-3	91	125	1905	-96	1907	-846
12.50	88	-62	108	125	2030	-98	2032	-846
10.00	85	-125	151	125	2155	-99	2158	-846
7.00	81	-205	221	125	2306	-100	2308	-846
7.00	82	-206	222	112	3170	-112	3172	-774
5.00	80	-284	295	112	3270	-113	3272	-774
2.50	76	-384	391	112	3396	-114	3397	-773
0.00	73	-488	493	112	3521	-115	3523	-770

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	74	109	132	-113	-1056	99	1061	-2278
37.50	77	139	159	-113	-931	98	936	-2277
35.00	80	165	183	-113	-806	97	812	-2277
33.00	82	183	201	-113	-707	96	713	-2277
33.00	83	182	200	-126	157	84	178	-2205
30.00	86	174	194	-126	307	82	317	-2205
27.50	88	163	185	-126	431	81	439	-2205
25.00	91	148	174	-126	555	79	561	-2205
22.50	93	129	160	-126	680	78	684	-2206
20.00	96	107	144	-126	805	76	808	-2206
20.00	97	106	143	-140	1668	63	1670	-2136
17.50	98	54	112	-140	1793	61	1795	-2136
15.00	100	-2	100	-140	1918	59	1919	-2136
12.50	102	-61	119	-140	2044	56	2045	-2136
10.00	104	-124	162	-140	2169	54	2170	-2135
7.00	106	-205	231	-140	2320	51	2320	-2136
7.00	107	-206	232	-153	3184	36	3184	-2064
5.00	107	-284	303	-153	3284	35	3284	-2064
2.50	108	-384	399	-153	3410	32	3410	-2063
0.00	109	-488	501	-153	3537	29	3537	-2060

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
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Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.3	12.6	12.7	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.1	11.2	11.2	0.1	1.53	0.10	0.00	0.29	1.63	65.00	39.83
55.00	1.0	9.8	9.8	0.1	2.77	0.11	0.00	0.28	2.88	65.00	22.57
50.00	0.8	8.4	8.4	0.1	3.77	0.12	0.00	0.27	3.90	65.00	16.68
48.00	0.8	7.8	7.9	0.1	4.12	0.13	0.00	0.26	4.25	65.00	15.30
48.00	0.8	7.8	7.9	0.1	2.79	0.08	0.00	0.18	2.87	65.00	22.63
45.00	0.7	7.0	7.1	0.1	3.11	0.09	0.00	0.17	3.20	65.00	20.32
45.00	0.7	7.0	7.1	0.1	4.32	0.28	3.67	5.05	9.34	65.00	6.96
40.00	0.6	5.7	5.7	0.1	9.41	0.29	3.36	4.67	11.68	65.00	5.57
35.00	0.5	4.5	4.5	0.0	13.64	0.29	3.08	4.33	15.17	65.00	4.29
32.00	0.4	3.8	3.8	0.0	15.83	0.30	2.93	4.15	17.10	65.00	3.80
32.00	0.4	3.8	3.8	0.0	15.76	0.35	2.90	4.15	16.97	65.00	3.83
30.00	0.4	3.4	3.4	0.0	17.23	0.35	2.80	4.04	18.32	65.00	3.55
30.00	0.4	3.4	3.4	0.0	17.23	0.36	2.80	4.04	18.33	65.00	3.55
25.00	0.3	2.4	2.4	0.0	20.47	0.37	2.59	3.77	21.38	65.00	3.04
21.25	0.2	1.7	1.7	0.0	22.55	0.37	2.44	3.60	23.36	65.00	2.78
21.25	0.2	1.7	1.7	0.0	22.81	0.40	2.33	3.51	23.57	65.00	2.76
20.00	0.2	1.5	1.5	0.0	23.47	0.40	2.28	3.46	24.21	65.00	2.69
15.00	0.1	0.9	0.9	0.0	25.84	0.40	2.12	3.25	26.50	65.00	2.45
10.00	0.0	0.4	0.4	0.0	27.81	0.41	1.97	3.06	28.43	65.00	2.29
5.00	0.0	0.1	0.1	0.0	29.46	0.41	1.84	2.89	30.05	65.00	2.16
0.00	0.0	0.0	0.0	0.0	30.83	0.42	1.72	2.74	31.39	65.00	2.07

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	16.8	16.9	0.2	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.0	15.0	15.0	0.2	1.54	0.10	0.00	0.29	1.64	65.00	39.68
55.00	0.9	13.1	13.2	0.2	2.78	0.11	0.00	0.28	2.89	65.00	22.47
50.00	0.8	11.3	11.3	0.1	3.79	0.12	0.00	0.27	3.92	65.00	16.60
48.00	0.7	10.6	10.6	0.1	4.15	0.13	0.00	0.27	4.27	65.00	15.22
48.00	0.7	10.6	10.6	0.1	2.80	0.08	0.00	0.18	2.89	65.00	22.51
45.00	0.7	9.5	9.6	0.1	3.12	0.09	0.00	0.17	3.22	65.00	20.21
45.00	0.7	9.5	9.6	0.1	2.86	0.59	0.00	2.32	5.31	65.00	12.25
40.00	0.6	7.8	7.8	0.1	10.24	0.59	0.00	2.22	10.96	65.00	5.93
35.00	0.5	6.1	6.1	0.1	18.07	0.58	0.00	2.13	18.65	65.00	3.49
32.00	0.4	5.2	5.2	0.1	22.25	0.58	0.00	2.07	22.83	65.00	2.85
32.00	0.4	5.2	5.2	0.1	19.12	0.77	0.01	2.01	19.95	65.00	3.26
30.00	0.4	4.6	4.6	0.0	21.47	0.76	0.01	1.98	22.23	65.00	2.92
30.00	0.4	4.6	4.6	0.0	21.47	0.78	0.01	1.98	22.25	65.00	2.92
25.00	0.3	3.2	3.3	0.0	27.12	0.76	0.01	1.90	27.88	65.00	2.33
21.25	0.2	2.4	2.4	0.0	30.75	0.76	0.01	1.84	31.50	65.00	2.06
21.25	0.2	2.4	2.4	0.0	29.30	0.88	0.01	1.83	30.17	65.00	2.15
20.00	0.2	2.1	2.1	0.0	30.41	0.87	0.01	1.80	31.29	65.00	2.08
15.00	0.1	1.2	1.2	0.0	34.42	0.86	0.01	1.73	35.29	65.00	1.84
10.00	0.1	0.5	0.5	0.0	37.79	0.85	0.01	1.67	38.64	65.00	1.68
5.00	0.0	0.1	0.1	0.0	40.60	0.84	0.01	1.60	41.44	65.00	1.57
0.00	0.0	0.0	0.0	0.0	42.95	0.83	0.01	1.55	43.78	65.00	1.48

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.1	12.6	12.7	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.0	11.2	11.2	0.1	1.53	0.10	0.00	0.29	1.63	65.00	39.81
55.00	0.9	9.8	9.8	0.1	2.77	0.11	0.00	0.28	2.88	65.00	22.56
50.00	0.8	8.4	8.4	0.1	3.78	0.12	0.00	0.27	3.90	65.00	16.67
48.00	0.7	7.9	7.9	0.1	4.12	0.13	0.00	0.26	4.25	65.00	15.29
48.00	0.7	7.9	7.9	0.1	2.79	0.08	0.00	0.18	2.87	65.00	22.61
45.00	0.7	7.0	7.1	0.1	3.11	0.09	0.00	0.17	3.20	65.00	20.31
45.00	0.7	7.0	7.1	0.1	5.52	0.38	3.68	5.15	10.53	65.00	6.17
40.00	0.6	5.7	5.8	0.1	9.34	0.38	3.36	4.76	12.15	65.00	5.35
35.00	0.5	4.5	4.5	0.0	13.56	0.39	3.09	4.43	15.08	65.00	4.31
32.00	0.4	3.8	3.8	0.0	16.10	0.39	2.93	4.24	17.33	65.00	3.75
32.00	0.4	3.8	3.8	0.0	15.71	0.52	2.91	4.22	17.38	65.00	3.74
30.00	0.4	3.4	3.4	0.0	17.05	0.52	2.81	4.11	18.51	65.00	3.51
30.00	0.4	3.4	3.4	0.0	17.05	0.54	2.81	4.11	18.52	65.00	3.51
25.00	0.3	2.4	2.4	0.0	20.53	0.53	2.60	3.84	21.55	65.00	3.02
21.25	0.2	1.7	1.7	0.0	22.77	0.53	2.45	3.66	23.69	65.00	2.74
21.25	0.2	1.7	1.7	0.0	22.71	0.62	2.34	3.54	23.68	65.00	2.75
20.00	0.2	1.5	1.5	0.0	23.39	0.62	2.29	3.48	24.33	65.00	2.67
15.00	0.1	0.9	0.9	0.0	25.81	0.62	2.13	3.27	26.68	65.00	2.44
10.00	0.1	0.4	0.4	0.0	27.83	0.61	1.98	3.08	28.66	65.00	2.27
5.00	0.0	0.1	0.1	0.0	29.52	0.61	1.85	2.91	30.30	65.00	2.15
0.00	0.0	0.0	0.0	0.0	30.92	0.61	1.73	2.76	31.67	65.00	2.05

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	9.5	9.6	0.1	16.15	0.11	1.51	4.00	16.49	65.00	3.94
37.50	0.7	9.5	9.6	0.2	7.62	0.11	1.51	4.00	8.20	65.00	7.92
35.00	0.7	9.6	9.6	0.2	1.02	0.11	1.51	3.99	6.93	65.00	9.38
33.00	0.7	9.6	9.6	0.3	7.68	0.11	1.51	3.99	8.16	65.00	7.97
33.00	0.7	9.6	9.6	0.3	7.68	0.25	1.51	2.21	8.32	65.00	7.82
30.00	0.7	9.6	9.7	0.4	10.51	0.25	1.51	2.20	11.05	65.00	5.88
27.50	0.7	9.6	9.7	0.4	12.85	0.25	1.51	2.20	13.33	65.00	4.88
25.00	0.7	9.6	9.6	0.4	15.16	0.25	1.51	2.19	15.60	65.00	4.17
22.50	0.7	9.5	9.5	0.4	17.44	0.25	1.51	2.19	17.85	65.00	3.64
20.00	0.7	9.3	9.4	0.4	19.70	0.25	1.51	2.18	20.09	65.00	3.24
20.00	0.7	9.3	9.4	0.4	19.70	0.38	1.51	2.64	20.23	65.00	3.21
17.50	0.7	9.1	9.2	0.4	15.82	0.38	1.51	2.65	16.38	65.00	3.97
15.00	0.7	8.9	8.9	0.3	11.92	0.38	1.51	2.66	12.53	65.00	5.19
12.50	0.7	8.6	8.6	0.3	7.98	0.38	1.51	2.67	8.69	65.00	7.48
10.00	0.7	8.3	8.3	0.2	5.01	0.38	1.51	2.68	6.28	65.00	10.36
7.00	0.7	7.9	7.9	0.1	3.74	0.38	1.51	2.69	5.73	65.00	11.34
7.00	0.7	7.9	7.9	0.1	3.74	0.50	1.51	4.46	8.38	65.00	7.76
5.00	0.7	7.6	7.6	0.1	9.17	0.50	1.51	4.47	10.58	65.00	6.15
2.50	0.7	7.3	7.3	0.1	18.98	0.51	1.51	4.47	19.71	65.00	3.30
0.00	0.7	7.0	7.1	0.1	29.13	0.51	1.51	4.48	29.79	65.00	2.18

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.7	7.0	7.1	0.1	24.32	0.14	1.53	4.32	24.56	65.00	2.65
37.50	0.7	7.3	7.3	0.1	14.77	0.14	1.53	4.31	15.51	65.00	4.19
35.00	0.7	7.6	7.6	0.2	6.91	0.13	1.53	4.31	9.09	65.00	7.15
33.00	0.7	7.9	7.9	0.3	4.36	0.13	1.53	4.31	8.50	65.00	7.65
33.00	0.7	7.9	7.9	0.3	4.36	0.28	1.53	2.56	6.23	65.00	10.43
30.00	0.7	8.3	8.3	0.4	6.52	0.28	1.53	2.55	7.98	65.00	8.15
27.50	0.7	8.6	8.6	0.4	9.81	0.28	1.53	2.55	10.56	65.00	6.15
25.00	0.7	8.9	8.9	0.4	13.15	0.28	1.53	2.54	13.80	65.00	4.71
22.50	0.7	9.1	9.2	0.4	16.47	0.28	1.53	2.54	17.05	65.00	3.81
20.00	0.7	9.3	9.4	0.4	19.75	0.28	1.53	2.54	20.29	65.00	3.20
20.00	0.7	9.3	9.4	0.4	19.75	0.42	1.53	2.40	20.41	65.00	3.18
17.50	0.7	9.5	9.5	0.4	16.92	0.42	1.53	2.41	17.62	65.00	3.69
15.00	0.7	9.6	9.6	0.3	14.05	0.42	1.53	2.43	14.82	65.00	4.39
12.50	0.7	9.6	9.7	0.3	11.15	0.42	1.53	2.44	12.09	65.00	5.38
10.00	0.7	9.6	9.7	0.2	9.69	0.42	1.53	2.46	10.92	65.00	5.95
7.00	0.7	9.6	9.6	0.1	8.20	0.42	1.53	2.47	9.57	65.00	6.79
7.00	0.7	9.6	9.6	0.1	8.20	0.55	1.53	4.19	10.82	65.00	6.01
5.00	0.7	9.6	9.6	0.1	7.78	0.55	1.53	4.20	11.04	65.00	5.89
2.50	0.7	9.5	9.6	0.1	14.56	0.56	1.53	4.21	16.08	65.00	4.04
0.00	0.7	9.5	9.6	0.1	21.83	0.56	1.53	4.22	23.05	65.00	2.82

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	5.2	5.2	0.1	4.97	0.17	2.68	2.96	7.02	65.00	9.26
37.50	0.4	5.2	5.2	0.1	5.04	0.17	2.68	2.94	7.05	65.00	9.22
35.00	0.4	5.1	5.2	0.1	5.10	0.17	2.68	2.93	7.07	65.00	9.20
33.00	0.4	5.1	5.1	0.2	5.12	0.17	2.68	2.91	7.07	65.00	9.20
33.00	0.4	5.1	5.1	0.2	5.21	0.16	1.80	1.89	6.20	65.00	10.49
30.00	0.4	5.1	5.1	0.2	4.85	0.16	1.80	1.89	5.90	65.00	11.01
27.50	0.4	5.0	5.0	0.2	4.52	0.16	1.80	1.90	5.64	65.00	11.52
25.00	0.4	4.9	4.9	0.2	4.17	0.16	1.80	1.91	5.37	65.00	12.10
22.50	0.4	4.8	4.9	0.2	3.80	0.16	1.80	1.92	5.09	65.00	12.77
20.00	0.4	4.8	4.8	0.2	3.40	0.16	1.80	1.94	4.81	65.00	13.52
20.00	0.4	4.8	4.8	0.2	3.49	0.16	0.92	1.25	4.19	65.00	15.52
17.50	0.4	4.7	4.7	0.1	2.77	0.16	0.92	1.27	3.59	65.00	18.12
15.00	0.4	4.5	4.6	0.1	2.02	0.16	0.92	1.29	3.05	65.00	21.33
12.50	0.4	4.4	4.4	0.1	2.04	0.16	0.92	1.31	3.15	65.00	20.64
10.00	0.4	4.3	4.3	0.0	2.74	0.16	0.92	1.32	3.52	65.00	18.46
7.00	0.4	4.2	4.2	0.0	4.12	0.16	0.92	1.34	4.73	65.00	13.74
7.00	0.4	4.2	4.2	0.0	4.15	0.15	0.04	0.68	4.36	65.00	14.92
5.00	0.4	4.1	4.1	0.0	5.68	0.15	0.04	0.69	5.87	65.00	11.07
2.50	0.4	3.9	3.9	0.0	7.64	0.15	0.04	0.71	7.82	65.00	8.31
0.00	0.4	3.8	3.8	0.0	9.65	0.15	0.04	0.73	9.83	65.00	6.61

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.4	3.8	3.8	0.0	1.39	0.24	0.05	0.32	1.63	65.00	39.78
37.50	0.4	3.9	3.9	0.1	2.29	0.24	0.05	0.30	2.53	65.00	25.68
35.00	0.4	4.1	4.1	0.1	3.14	0.24	0.05	0.28	3.37	65.00	19.27
33.00	0.4	4.2	4.2	0.2	3.77	0.24	0.05	0.27	4.01	65.00	16.21
33.00	0.4	4.2	4.2	0.2	3.80	0.23	0.93	1.01	4.29	65.00	15.15
30.00	0.4	4.3	4.3	0.2	3.84	0.23	0.93	1.02	4.32	65.00	15.05
27.50	0.4	4.4	4.4	0.2	3.81	0.23	0.93	1.02	4.29	65.00	15.17
25.00	0.4	4.5	4.6	0.2	3.72	0.23	0.93	1.03	4.20	65.00	15.48
22.50	0.4	4.7	4.7	0.2	3.58	0.23	0.93	1.05	4.06	65.00	16.00
20.00	0.4	4.8	4.8	0.2	3.42	0.23	0.93	1.06	3.90	65.00	16.66
20.00	0.4	4.8	4.8	0.2	3.51	0.22	1.81	2.15	4.95	65.00	13.12
17.50	0.4	4.8	4.9	0.1	3.31	0.22	1.81	2.16	4.84	65.00	13.42
15.00	0.4	4.9	4.9	0.1	3.08	0.22	1.81	2.18	4.73	65.00	13.76
12.50	0.4	5.0	5.0	0.1	3.65	0.22	1.81	2.20	5.04	65.00	12.90
10.00	0.4	5.1	5.1	0.0	4.40	0.22	1.81	2.21	5.59	65.00	11.63
7.00	0.4	5.1	5.1	0.0	5.33	0.22	1.81	2.24	6.33	65.00	10.27
7.00	0.4	5.1	5.1	0.0	5.41	0.22	2.69	3.34	7.67	65.00	8.47
5.00	0.4	5.1	5.2	0.0	7.08	0.22	2.69	3.35	8.49	65.00	7.65
2.50	0.4	5.2	5.2	0.0	9.27	0.22	2.69	3.37	10.43	65.00	6.23
0.00	0.4	5.2	5.2	0.1	11.52	0.22	2.69	3.39	12.50	65.00	5.20

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.4	2.4	0.0	2.25	0.07	1.17	1.32	3.15	65.00	20.66
37.50	0.2	2.4	2.4	0.1	2.62	0.07	1.17	1.30	3.32	65.00	19.58
35.00	0.2	2.4	2.4	0.1	3.00	0.07	1.17	1.28	3.63	65.00	17.92
33.00	0.2	2.4	2.4	0.1	3.27	0.07	1.17	1.27	3.86	65.00	16.85
33.00	0.2	2.4	2.4	0.1	3.26	0.06	1.06	1.09	3.80	65.00	17.12
30.00	0.2	2.3	2.3	0.1	3.13	0.06	1.06	1.11	3.69	65.00	17.62
27.50	0.2	2.3	2.3	0.1	2.96	0.06	1.06	1.12	3.55	65.00	18.31
25.00	0.2	2.3	2.3	0.1	2.73	0.06	1.06	1.14	3.37	65.00	19.31
22.50	0.2	2.2	2.3	0.1	2.45	0.06	1.06	1.16	3.14	65.00	20.67
20.00	0.2	2.2	2.2	0.1	2.12	0.06	1.06	1.17	2.91	65.00	22.35
20.00	0.2	2.2	2.2	0.1	2.11	0.06	0.96	1.19	2.92	65.00	22.26
17.50	0.2	2.2	2.2	0.1	1.69	0.06	0.96	1.21	2.70	65.00	24.10
15.00	0.2	2.1	2.1	0.0	1.35	0.06	0.96	1.23	2.54	65.00	25.57
12.50	0.2	2.1	2.1	0.0	1.67	0.06	0.96	1.25	2.74	65.00	23.73
10.00	0.2	2.0	2.0	0.0	2.36	0.06	0.96	1.26	3.06	65.00	21.22
7.00	0.2	1.9	1.9	0.0	3.51	0.06	0.96	1.28	4.05	65.00	16.07
7.00	0.2	1.9	1.9	0.0	3.54	0.05	0.86	1.30	4.02	65.00	16.18
5.00	0.2	1.9	1.9	0.0	4.66	0.05	0.86	1.32	5.05	65.00	12.88
2.50	0.2	1.8	1.8	0.0	6.11	0.05	0.86	1.33	6.42	65.00	10.12
0.00	0.2	1.7	1.7	0.0	7.61	0.05	0.86	1.35	7.88	65.00	8.25

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.7	1.7	0.0	2.05	0.15	0.86	1.01	2.71	65.00	23.97
37.50	0.2	1.8	1.8	0.1	2.51	0.15	0.86	0.99	3.09	65.00	21.04
35.00	0.2	1.9	1.9	0.1	2.91	0.15	0.86	0.98	3.44	65.00	18.92
33.00	0.2	1.9	1.9	0.1	3.19	0.15	0.86	0.96	3.69	65.00	17.64
33.00	0.2	1.9	1.9	0.1	3.18	0.15	0.97	0.99	3.71	65.00	17.50
30.00	0.2	2.0	2.0	0.1	3.08	0.15	0.97	1.01	3.62	65.00	17.98
27.50	0.2	2.1	2.1	0.1	2.93	0.15	0.97	1.03	3.48	65.00	18.68
25.00	0.2	2.1	2.1	0.1	2.73	0.15	0.97	1.04	3.30	65.00	19.72
22.50	0.2	2.2	2.2	0.1	2.47	0.15	0.97	1.06	3.07	65.00	21.19
20.00	0.2	2.2	2.2	0.1	2.16	0.15	0.97	1.08	2.80	65.00	23.23
20.00	0.2	2.2	2.2	0.1	2.15	0.15	1.07	1.30	2.94	65.00	22.09
17.50	0.2	2.2	2.3	0.1	1.78	0.15	1.07	1.32	2.79	65.00	23.33
15.00	0.2	2.3	2.3	0.1	1.48	0.15	1.07	1.34	2.67	65.00	24.34
12.50	0.2	2.3	2.3	0.0	1.87	0.15	1.07	1.35	2.88	65.00	22.59
10.00	0.2	2.3	2.3	0.0	2.46	0.15	1.07	1.37	3.16	65.00	20.56
7.00	0.2	2.4	2.4	0.0	3.66	0.15	1.07	1.39	4.14	65.00	15.68
7.00	0.2	2.4	2.4	0.0	3.68	0.14	1.17	1.62	4.23	65.00	15.37
5.00	0.2	2.4	2.4	0.0	4.83	0.14	1.17	1.63	5.26	65.00	12.36
2.50	0.2	2.4	2.4	0.0	6.31	0.14	1.17	1.65	6.67	65.00	9.74
0.00	0.2	2.4	2.4	0.0	7.85	0.14	1.17	1.67	8.17	65.00	7.96

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	724	2554	2655	1513
60.00	156	-43	162	0	725	2617	2715	1819
55.00	315	-87	327	0	726	2682	2779	2143
50.00	478	-131	496	0	727	2751	2845	2484
48.00	545	-148	565	0	727	2779	2873	2624
48.00	545	-148	565	0	727	2779	2872	2625
45.00	646	-174	669	0	728	2825	2918	2947
45.00	850	-442	958	1583	-1118	22250	22278	9268
40.00	2187	-374	2219	1583	-1147	22315	22345	9855
35.00	3529	-304	3542	1583	-1168	22382	22412	10470
32.00	4335	-262	4343	1583	-1167	22433	22463	10831
32.00	4346	-220	4351	1588	2057	23391	23481	12889
30.00	4907	-269	4915	1588	2058	23425	23515	13135
30.00	4909	-269	4917	1588	2042	23536	23625	13615
25.00	6324	-390	6336	1588	2022	23592	23678	14303
21.25	7387	-481	7403	1588	2023	23658	23745	14795
21.25	7502	-415	7514	1533	4056	24040	24380	16056
20.00	7863	-475	7877	1533	4043	24033	24371	16270
15.00	9308	-716	9335	1533	4024	24072	24406	17031
10.00	10755	-956	10798	1533	4005	24107	24437	17821
5.00	12204	-1195	12263	1533	3985	24138	24465	18638
0.00	13656	-1434	13731	1533	3986	24231	24557	19397

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	703	2571	2665	1494
60.00	157	-42	163	0	703	2636	2728	1801
55.00	318	-84	329	0	704	2703	2793	2125
50.00	482	-127	498	0	704	2774	2862	2465
48.00	549	-144	567	0	704	2804	2891	2606
48.00	549	-144	567	0	704	2803	2890	2606
45.00	651	-169	672	0	704	2852	2938	2929
45.00	244	501	557	-3	6967	36687	37343	18964
40.00	2448	83	2449	-3	6969	36742	37397	19575
35.00	4655	-335	4667	-3	6968	36791	37445	20227
32.00	5981	-586	6009	-3	6968	36845	37498	20589
32.00	5269	56	5270	-6	6166	36331	36851	27467
30.00	6142	-92	6142	-6	6166	36367	36886	27713
30.00	6144	-92	6144	-6	6165	36441	36959	28232
25.00	8333	-462	8346	-6	6161	36444	36961	28977
21.25	9974	-740	10002	-6	6162	36513	37029	29468
21.25	9657	-235	9660	-7	5116	36990	37342	34137
20.00	10212	-312	10217	-7	5113	36926	37279	34398
15.00	12431	-619	12446	-7	5106	36870	37222	35240
10.00	14646	-925	14675	-7	5097	36802	37153	36116
5.00	16857	-1231	16902	-7	5085	36723	37073	37024
0.00	19063	-1536	19125	-7	5085	36816	37165	37783

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	682	2565	2655	1513
60.00	157	-41	162	0	682	2628	2715	1820
55.00	317	-82	327	0	682	2693	2778	2144
50.00	480	-123	496	0	682	2762	2845	2484
48.00	547	-139	564	0	681	2790	2872	2625
48.00	547	-139	564	0	681	2790	2872	2626
45.00	648	-164	669	0	681	2836	2917	2948
45.00	851	793	1163	-1589	8315	22292	23793	12081
40.00	2191	294	2211	-1589	8346	22345	23853	12667
35.00	3534	-208	3540	-1589	8367	22401	23912	13282
32.00	4341	-509	4371	-1589	8367	22451	23960	13644
32.00	4351	93	4352	-1595	5962	23405	24153	18390
30.00	4913	-50	4914	-1595	5963	23440	24186	18637
30.00	4915	-51	4916	-1595	5978	23536	24283	19116
25.00	6330	-411	6343	-1595	5994	23572	24322	19805
21.25	7392	-680	7424	-1595	5994	23639	24387	20297
21.25	7507	-238	7511	-1541	5011	24009	24527	23672
20.00	7868	-314	7874	-1541	5020	23983	24503	23886
15.00	9309	-617	9330	-1541	5032	23992	24514	24647
10.00	10751	-920	10791	-1541	5040	23996	24520	25436
5.00	12194	-1224	12255	-1541	5045	23997	24521	26253
0.00	13636	-1527	13722	-1541	5045	24090	24612	27013

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-966	-369	1034	202	-6607	16915	18160	1734
37.50	-459	-173	490	202	-6483	16880	18082	1734
35.00	47	20	51	202	-6374	16841	18007	1720
33.00	451	172	482	202	-6275	16814	17947	1720
33.00	451	172	482	202	-1732	4873	5172	3749
30.00	625	232	667	202	-1584	4827	5080	3756
27.50	770	277	818	202	-1460	4787	5004	3763
25.00	913	319	967	202	-1336	4746	4930	3771
22.50	1055	358	1114	202	-1212	4704	4858	3780
20.00	1195	392	1258	202	-1087	4670	4795	3780
20.00	1195	392	1258	203	3496	-7278	8074	5702
17.50	976	286	1017	203	3620	-7313	8159	5702
15.00	756	175	776	203	3750	-7354	8255	5688
12.50	535	61	538	203	3880	-7394	8350	5677
10.00	312	-58	318	203	4011	-7432	8446	5666
7.00	44	-205	209	203	4160	-7473	8553	5666
7.00	44	-205	209	203	8773	-19410	21301	7525
5.00	-422	-416	593	203	8872	-19437	21366	7525
2.50	-1005	-685	1216	203	9000	-19445	21427	7589
0.00	-1589	-957	1855	203	9124	-19479	21510	7589

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-1583	-267	1606	-204	-6305	19434	20431	1807
37.50	-1001	-80	1004	-204	-6181	19400	20361	1808
35.00	-419	104	432	-204	-6048	19372	20294	1774
33.00	46	247	251	-204	-5940	19349	20240	1761
33.00	46	247	251	-204	-1330	7456	7574	3908
30.00	313	292	429	-204	-1175	7414	7507	3913
27.50	535	326	627	-204	-1046	7377	7451	3920
25.00	756	355	835	-204	-916	7338	7395	3930
22.50	976	381	1047	-204	-786	7298	7340	3943
20.00	1194	402	1260	-204	-661	7264	7294	3943
20.00	1194	402	1260	-204	3923	-4662	6093	6012
17.50	1054	283	1091	-204	4047	-4696	6200	6012
15.00	912	159	926	-204	4172	-4743	6317	6001
12.50	769	32	770	-204	4296	-4789	6433	5992
10.00	625	-99	632	-204	4414	-4842	6552	5981
7.00	449	-260	519	-204	4563	-4883	6684	5981
7.00	449	-260	519	-204	9109	-16832	19139	7957
5.00	45	-480	482	-204	9209	-16860	19211	7957
2.50	-461	-758	887	-204	9302	-16896	19288	7989
0.00	-969	-1039	1420	-204	9426	-16931	19378	7989

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	290	31	292	356	-2069	-249	2084	-2423
37.50	282	91	296	356	-1945	-284	1966	-2422
35.00	273	148	310	356	-1821	-318	1849	-2422
33.00	265	190	326	356	-1721	-345	1756	-2422
33.00	265	190	326	240	-123	-415	433	-2421
30.00	249	192	315	240	26	-456	457	-2420
27.50	235	189	302	240	150	-488	511	-2421
25.00	220	183	286	240	274	-521	588	-2421
22.50	204	173	267	240	398	-553	681	-2421
20.00	187	159	246	240	522	-586	784	-2422
20.00	187	160	246	125	2120	-651	2218	-2423
17.50	167	94	191	125	2244	-683	2346	-2424
15.00	146	25	148	125	2369	-715	2474	-2424
12.50	124	-48	133	125	2493	-748	2603	-2425
10.00	101	-125	160	125	2618	-781	2732	-2425
7.00	72	-221	233	125	2768	-819	2887	-2424
7.00	72	-221	232	10	4368	-882	4457	-2424
5.00	51	-327	331	10	4468	-909	4560	-2424
2.50	23	-463	463	10	4594	-942	4689	-2422
0.00	-6	-603	603	10	4720	-975	4820	-2418

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-4	42	42	-10	-2033	971	2253	-3237
37.50	24	101	104	-10	-1909	937	2127	-3237
35.00	52	156	165	-10	-1785	904	2001	-3236
33.00	73	198	211	-10	-1686	878	1901	-3235
33.00	74	197	211	-125	-88	815	819	-3233
30.00	102	198	223	-125	61	775	777	-3233
27.50	125	194	231	-125	185	742	765	-3233
25.00	147	187	238	-125	309	709	773	-3233
22.50	168	176	243	-125	432	676	803	-3233
20.00	187	161	247	-125	556	644	851	-3233
20.00	187	160	247	-241	2154	578	2230	-3234
17.50	204	94	225	-241	2279	545	2343	-3234
15.00	220	24	221	-241	2403	511	2457	-3234
12.50	235	-50	240	-241	2528	477	2572	-3234
10.00	249	-128	280	-241	2653	443	2690	-3233
7.00	264	-226	348	-241	2803	403	2831	-3233
7.00	264	-226	348	-356	4403	331	4415	-3233
5.00	271	-333	430	-356	4504	302	4514	-3230
2.50	280	-470	547	-356	4628	268	4636	-3230
0.00	287	-611	675	-356	4755	232	4761	-3226

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	89	60	107	159	-1243	263	1271	-996
37.50	96	95	135	159	-1119	230	1142	-995
35.00	103	127	163	159	-994	197	1013	-995
33.00	107	149	184	159	-895	170	911	-995
33.00	107	149	184	144	-32	120	124	-994
30.00	111	148	185	144	117	80	142	-994
27.50	113	143	182	144	242	47	246	-994
25.00	113	133	175	144	366	15	366	-994
22.50	113	121	166	144	490	-18	491	-994
20.00	112	104	153	144	615	-51	617	-994
20.00	112	104	153	130	1478	-99	1481	-995
17.50	109	58	123	130	1603	-132	1608	-995
15.00	104	8	105	130	1727	-164	1735	-996
12.50	99	-46	109	130	1852	-196	1862	-996
10.00	93	-103	139	130	1977	-228	1990	-995
7.00	84	-177	196	130	2126	-267	2143	-995
7.00	84	-177	196	115	2990	-314	3007	-995
5.00	76	-250	261	115	3090	-340	3109	-995
2.50	65	-345	351	115	3215	-372	3237	-994
0.00	54	-443	446	115	3340	-404	3365	-992

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	55	66	85	-115	-1228	403	1292	-2044
37.50	66	101	120	-115	-1103	370	1163	-2044
35.00	77	132	153	-115	-978	338	1035	-2044
33.00	85	154	176	-115	-879	312	933	-2043
33.00	85	154	176	-130	-16	265	265	-2043
30.00	93	152	178	-130	133	225	262	-2042
27.50	100	146	177	-130	258	193	322	-2042
25.00	105	137	172	-130	382	161	414	-2042
22.50	109	123	165	-130	506	128	522	-2043
20.00	113	106	155	-130	630	95	637	-2043
20.00	113	106	155	-144	1493	46	1494	-2043
17.50	114	60	128	-144	1618	13	1618	-2043
15.00	114	9	114	-144	1742	-20	1742	-2044
12.50	112	-45	121	-144	1867	-53	1868	-2044
10.00	110	-103	151	-144	1992	-86	1994	-2043
7.00	107	-177	207	-144	2141	-126	2145	-2043
7.00	106	-177	207	-159	3005	-177	3010	-2043
5.00	102	-251	271	-159	3105	-204	3112	-2042
2.50	95	-346	359	-159	3230	-237	3239	-2042
0.00	88	-444	453	-159	3355	-271	3366	-2040

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.2	13.2	13.3	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	1.0	11.7	11.8	0.1	1.56	0.10	0.00	0.30	1.66	65.00	39.11
55.00	0.9	10.3	10.3	0.1	2.84	0.11	0.00	0.29	2.95	65.00	22.05
50.00	0.7	8.8	8.8	0.1	3.89	0.12	0.00	0.28	4.01	65.00	16.19
48.00	0.7	8.2	8.3	0.1	4.26	0.13	0.00	0.28	4.39	65.00	14.81
48.00	0.7	8.2	8.3	0.1	2.88	0.08	0.00	0.19	2.97	65.00	21.90
45.00	0.6	7.4	7.4	0.1	3.23	0.09	0.00	0.18	3.32	65.00	19.58
45.00	0.6	7.4	7.4	0.1	4.51	0.29	3.73	5.13	9.53	65.00	6.82
40.00	0.5	6.0	6.0	0.1	9.73	0.29	3.40	4.75	12.01	65.00	5.41
35.00	0.4	4.7	4.7	0.0	14.08	0.30	3.12	4.42	15.62	65.00	4.16
32.00	0.3	4.0	4.0	0.0	16.33	0.30	2.97	4.23	17.62	65.00	3.69
32.00	0.3	4.0	4.0	0.0	16.33	0.36	2.98	4.29	17.59	65.00	3.70
30.00	0.3	3.5	3.5	0.0	17.86	0.36	2.88	4.18	19.00	65.00	3.42
30.00	0.3	3.5	3.5	0.0	17.87	0.37	2.88	4.19	19.02	65.00	3.42
25.00	0.2	2.5	2.5	0.0	21.28	0.38	2.66	3.92	22.22	65.00	2.92
21.25	0.2	1.8	1.8	0.0	23.47	0.38	2.51	3.73	24.31	65.00	2.67
21.25	0.2	1.8	1.8	0.0	23.78	0.41	2.42	3.68	24.59	65.00	2.64
20.00	0.2	1.6	1.6	0.0	24.48	0.41	2.38	3.62	25.27	65.00	2.57
15.00	0.1	0.9	0.9	0.0	27.02	0.42	2.21	3.41	27.73	65.00	2.34
10.00	0.0	0.4	0.4	0.0	29.16	0.42	2.06	3.22	29.82	65.00	2.18
5.00	0.0	0.1	0.1	0.0	30.95	0.42	1.92	3.04	31.57	65.00	2.06
0.00	0.0	0.0	0.0	0.0	32.45	0.43	1.80	2.89	33.04	65.00	1.97

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	17.5	17.6	0.3	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	0.9	15.6	15.6	0.2	1.57	0.10	0.00	0.30	1.67	65.00	38.98
55.00	0.8	13.7	13.7	0.2	2.85	0.11	0.00	0.29	2.96	65.00	21.96
50.00	0.7	11.8	11.8	0.2	3.91	0.12	0.00	0.28	4.03	65.00	16.12
48.00	0.6	11.1	11.1	0.1	4.29	0.12	0.00	0.28	4.41	65.00	14.74
48.00	0.6	11.1	11.1	0.1	2.90	0.08	0.00	0.19	2.98	65.00	21.80
45.00	0.6	9.9	10.0	0.1	3.24	0.09	0.00	0.19	3.34	65.00	19.48
45.00	0.6	9.9	10.0	0.1	2.64	0.59	0.01	2.36	5.21	65.00	12.48
40.00	0.5	8.1	8.1	0.1	10.51	0.58	0.01	2.26	11.23	65.00	5.79
35.00	0.4	6.4	6.4	0.1	18.50	0.58	0.01	2.16	19.08	65.00	3.41
32.00	0.3	5.4	5.4	0.1	22.75	0.57	0.01	2.11	23.33	65.00	2.79
32.00	0.3	5.4	5.4	0.1	19.59	0.77	0.01	2.08	20.41	65.00	3.18
30.00	0.3	4.8	4.8	0.1	22.12	0.76	0.01	2.05	22.88	65.00	2.84
30.00	0.3	4.8	4.8	0.1	22.12	0.77	0.01	2.05	22.90	65.00	2.84
25.00	0.2	3.4	3.4	0.0	27.99	0.76	0.01	1.97	28.76	65.00	2.26
21.25	0.2	2.5	2.5	0.0	31.77	0.75	0.01	1.92	32.52	65.00	2.00
21.25	0.2	2.5	2.5	0.0	30.36	0.87	0.01	1.93	31.23	65.00	2.08
20.00	0.2	2.2	2.2	0.0	31.55	0.87	0.01	1.91	32.42	65.00	2.00
15.00	0.1	1.3	1.3	0.0	35.83	0.86	0.01	1.84	36.70	65.00	1.77
10.00	0.0	0.6	0.6	0.0	39.44	0.85	0.01	1.77	40.29	65.00	1.61
5.00	0.0	0.1	0.1	0.0	42.47	0.84	0.01	1.70	43.32	65.00	1.50
0.00	0.0	0.0	0.0	0.0	45.01	0.83	0.01	1.65	45.85	65.00	1.42

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	13.2	13.3	0.1	0.01	0.09	0.00	0.31	0.54	65.00	99.90
60.00	0.8	11.7	11.8	0.1	1.56	0.10	0.00	0.30	1.66	65.00	39.11
55.00	0.7	10.3	10.3	0.1	2.84	0.11	0.00	0.29	2.95	65.00	22.06
50.00	0.6	8.8	8.8	0.1	3.89	0.12	0.00	0.28	4.01	65.00	16.20
48.00	0.6	8.2	8.3	0.1	4.26	0.13	0.00	0.28	4.39	65.00	14.81
48.00	0.6	8.2	8.3	0.1	2.88	0.08	0.00	0.19	2.97	65.00	21.91
45.00	0.6	7.4	7.4	0.1	3.23	0.09	0.00	0.18	3.32	65.00	19.59
45.00	0.6	7.4	7.4	0.1	5.61	0.38	3.74	5.24	10.68	65.00	6.09
40.00	0.5	6.0	6.0	0.1	9.66	0.38	3.42	4.85	12.45	65.00	5.22
35.00	0.4	4.7	4.7	0.0	14.00	0.38	3.13	4.51	15.52	65.00	4.19
32.00	0.3	4.0	4.0	0.0	16.60	0.38	2.98	4.32	17.81	65.00	3.65
32.00	0.3	4.0	4.0	0.0	16.22	0.51	2.99	4.35	17.89	65.00	3.63
30.00	0.3	3.5	3.5	0.0	17.67	0.51	2.89	4.23	19.10	65.00	3.40
30.00	0.3	3.5	3.5	0.0	17.68	0.52	2.89	4.24	19.12	65.00	3.40
25.00	0.2	2.5	2.5	0.0	21.32	0.52	2.67	3.97	22.32	65.00	2.91
21.25	0.2	1.8	1.8	0.0	23.66	0.52	2.52	3.78	24.56	65.00	2.65
21.25	0.2	1.8	1.8	0.0	23.64	0.61	2.44	3.70	24.59	65.00	2.64
20.00	0.2	1.6	1.6	0.0	24.37	0.61	2.39	3.65	25.29	65.00	2.57
15.00	0.1	0.9	0.9	0.0	26.95	0.60	2.22	3.43	27.81	65.00	2.34
10.00	0.0	0.4	0.4	0.0	29.12	0.60	2.07	3.24	29.93	65.00	2.17
5.00	0.0	0.1	0.1	0.0	30.94	0.60	1.93	3.06	31.71	65.00	2.05
0.00	0.0	0.0	0.0	0.0	32.46	0.60	1.81	2.90	33.20	65.00	1.96

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	9.9	10.0	0.1	16.45	0.12	1.55	4.08	16.79	65.00	3.87
37.50	0.6	10.0	10.0	0.2	7.80	0.12	1.55	4.07	8.40	65.00	7.74
35.00	0.6	10.0	10.0	0.2	0.81	0.12	1.55	4.06	7.03	65.00	9.25
33.00	0.6	10.0	10.1	0.3	7.67	0.12	1.55	4.05	8.19	65.00	7.94
33.00	0.6	10.0	10.1	0.3	7.67	0.25	1.55	2.27	8.35	65.00	7.78
30.00	0.6	10.1	10.1	0.4	10.60	0.26	1.55	2.26	11.16	65.00	5.82
27.50	0.6	10.1	10.1	0.4	13.00	0.26	1.55	2.25	13.51	65.00	4.81
25.00	0.6	10.0	10.0	0.4	15.36	0.26	1.55	2.24	15.82	65.00	4.11
22.50	0.6	9.9	9.9	0.4	17.68	0.26	1.55	2.23	18.11	65.00	3.59
20.00	0.6	9.7	9.8	0.4	19.96	0.26	1.55	2.22	20.37	65.00	3.19
20.00	0.6	9.7	9.8	0.4	19.96	0.39	1.55	2.67	20.51	65.00	3.17
17.50	0.6	9.5	9.6	0.4	16.09	0.39	1.55	2.69	16.67	65.00	3.90
15.00	0.6	9.3	9.3	0.3	12.18	0.39	1.55	2.70	12.82	65.00	5.07
12.50	0.6	9.0	9.0	0.3	8.23	0.39	1.55	2.71	8.97	65.00	7.24
10.00	0.6	8.7	8.7	0.2	4.94	0.39	1.55	2.72	6.24	65.00	10.41
7.00	0.6	8.3	8.3	0.1	3.28	0.39	1.55	2.74	5.55	65.00	11.71
7.00	0.6	8.3	8.3	0.1	3.28	0.51	1.55	4.52	8.30	65.00	7.83
5.00	0.6	8.0	8.0	0.1	8.74	0.51	1.55	4.53	10.26	65.00	6.33
2.50	0.6	7.7	7.7	0.1	18.95	0.52	1.55	4.53	19.68	65.00	3.30
0.00	0.6	7.4	7.4	0.1	29.18	0.52	1.55	4.54	29.84	65.00	2.18

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.6	7.4	7.4	0.1	24.90	0.12	1.56	4.40	25.13	65.00	2.59
37.50	0.6	7.7	7.7	0.1	15.20	0.12	1.56	4.39	15.50	65.00	4.19
35.00	0.6	8.0	8.0	0.2	6.79	0.12	1.56	4.38	9.05	65.00	7.18
33.00	0.6	8.3	8.3	0.3	3.91	0.12	1.56	4.37	8.39	65.00	7.75
33.00	0.6	8.3	8.3	0.3	3.91	0.27	1.56	2.62	5.98	65.00	10.87
30.00	0.6	8.7	8.7	0.4	6.39	0.27	1.56	2.61	7.74	65.00	8.39
27.50	0.6	9.0	9.0	0.4	9.85	0.27	1.56	2.60	10.60	65.00	6.13
25.00	0.6	9.3	9.3	0.4	13.28	0.27	1.56	2.59	13.91	65.00	4.67
22.50	0.6	9.5	9.6	0.4	16.66	0.27	1.56	2.58	17.23	65.00	3.77
20.00	0.6	9.7	9.8	0.4	20.00	0.27	1.56	2.58	20.53	65.00	3.17
20.00	0.6	9.7	9.8	0.4	20.00	0.41	1.56	2.41	20.65	65.00	3.15
17.50	0.6	9.9	9.9	0.4	17.21	0.41	1.56	2.43	17.91	65.00	3.63
15.00	0.6	10.0	10.0	0.3	14.38	0.41	1.56	2.44	15.13	65.00	4.30
12.50	0.6	10.1	10.1	0.3	11.50	0.41	1.56	2.46	12.34	65.00	5.27
10.00	0.6	10.1	10.1	0.2	9.78	0.41	1.56	2.48	11.00	65.00	5.91
7.00	0.6	10.0	10.1	0.2	8.19	0.41	1.56	2.50	9.56	65.00	6.80
7.00	0.6	10.0	10.1	0.2	8.19	0.54	1.56	4.22	10.76	65.00	6.04
5.00	0.6	10.0	10.0	0.1	7.33	0.54	1.56	4.23	10.75	65.00	6.05
2.50	0.6	10.0	10.0	0.1	13.95	0.54	1.56	4.24	15.54	65.00	4.18
0.00	0.6	9.9	10.0	0.1	21.17	0.54	1.56	4.26	22.42	65.00	2.90

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	5.4	5.4	0.1	4.45	0.16	2.72	3.01	6.74	65.00	9.64
37.50	0.3	5.4	5.4	0.1	4.70	0.16	2.72	3.00	6.88	65.00	9.44
35.00	0.3	5.4	5.4	0.1	4.91	0.16	2.72	2.98	7.01	65.00	9.28
33.00	0.3	5.4	5.4	0.2	5.05	0.16	2.72	2.97	7.09	65.00	9.17
33.00	0.3	5.4	5.4	0.2	5.05	0.16	1.84	1.90	6.08	65.00	10.69
30.00	0.3	5.3	5.3	0.2	4.83	0.16	1.84	1.91	5.91	65.00	11.00
27.50	0.3	5.2	5.3	0.2	4.61	0.16	1.84	1.91	5.74	65.00	11.33
25.00	0.3	5.2	5.2	0.2	4.35	0.16	1.84	1.92	5.53	65.00	11.74
22.50	0.3	5.1	5.1	0.2	4.05	0.16	1.84	1.94	5.31	65.00	12.24
20.00	0.3	5.0	5.0	0.2	3.72	0.16	1.84	1.95	5.06	65.00	12.84
20.00	0.3	5.0	5.0	0.2	3.72	0.16	0.96	1.27	4.40	65.00	14.77
17.50	0.3	4.9	4.9	0.1	3.02	0.16	0.96	1.28	3.82	65.00	17.03
15.00	0.3	4.8	4.8	0.1	2.29	0.16	0.96	1.30	3.25	65.00	20.01
12.50	0.3	4.7	4.7	0.1	2.11	0.16	0.96	1.32	3.22	65.00	20.16
10.00	0.3	4.5	4.5	0.0	2.44	0.16	0.96	1.34	3.36	65.00	19.33
7.00	0.3	4.4	4.4	0.0	3.69	0.16	0.96	1.36	4.39	65.00	14.80
7.00	0.3	4.4	4.4	0.0	3.69	0.16	0.08	0.70	3.92	65.00	16.58
5.00	0.3	4.3	4.3	0.0	5.11	0.16	0.08	0.71	5.33	65.00	12.19
2.50	0.3	4.1	4.1	0.0	6.94	0.16	0.08	0.73	7.15	65.00	9.09
0.00	0.3	4.0	4.0	0.0	8.90	0.16	0.08	0.75	9.06	65.00	7.17

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	4.0	4.0	0.0	0.64	0.22	0.08	0.39	0.90	65.00	72.21
37.50	0.3	4.1	4.1	0.1	1.63	0.22	0.08	0.37	1.85	65.00	35.05
35.00	0.3	4.3	4.3	0.1	2.61	0.22	0.08	0.36	2.84	65.00	22.92
33.00	0.3	4.4	4.4	0.1	3.36	0.22	0.08	0.34	3.58	65.00	18.17
33.00	0.3	4.4	4.4	0.1	3.35	0.22	0.96	1.07	3.87	65.00	16.80
30.00	0.3	4.5	4.5	0.2	3.53	0.22	0.96	1.07	4.03	65.00	16.11
27.50	0.3	4.7	4.7	0.2	3.62	0.22	0.96	1.07	4.11	65.00	15.81
25.00	0.3	4.8	4.8	0.2	3.64	0.22	0.96	1.07	4.13	65.00	15.73
22.50	0.3	4.9	4.9	0.2	3.60	0.22	0.96	1.07	4.10	65.00	15.87
20.00	0.3	5.0	5.0	0.2	3.73	0.22	0.96	1.08	4.22	65.00	15.40
20.00	0.3	5.0	5.0	0.2	3.73	0.22	1.84	2.15	5.12	65.00	12.70
17.50	0.3	5.1	5.1	0.1	3.57	0.22	1.84	2.17	5.03	65.00	12.92
15.00	0.3	5.2	5.2	0.1	3.38	0.22	1.84	2.19	4.92	65.00	13.21
12.50	0.3	5.2	5.3	0.1	3.76	0.22	1.84	2.20	5.13	65.00	12.68
10.00	0.3	5.3	5.3	0.1	4.43	0.22	1.84	2.22	5.64	65.00	11.53
7.00	0.3	5.4	5.4	0.0	5.26	0.22	1.84	2.24	6.30	65.00	10.32
7.00	0.3	5.4	5.4	0.0	5.25	0.22	2.73	3.34	7.58	65.00	8.57
5.00	0.3	5.4	5.4	0.0	6.55	0.22	2.73	3.36	8.15	65.00	7.98
2.50	0.3	5.4	5.4	0.0	8.62	0.22	2.73	3.37	9.85	65.00	6.60
0.00	0.3	5.4	5.4	0.1	10.73	0.22	2.73	3.39	11.78	65.00	5.52

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.5	2.5	0.0	1.67	0.07	1.21	1.39	2.85	65.00	22.81
37.50	0.2	2.5	2.5	0.1	1.99	0.07	1.21	1.37	3.02	65.00	21.49
35.00	0.2	2.5	2.5	0.1	2.49	0.07	1.21	1.36	3.28	65.00	19.82
33.00	0.2	2.5	2.5	0.1	2.85	0.07	1.21	1.34	3.57	65.00	18.21
33.00	0.2	2.5	2.5	0.1	2.85	0.07	1.10	1.12	3.50	65.00	18.57
30.00	0.2	2.5	2.5	0.1	2.85	0.07	1.10	1.12	3.50	65.00	18.56
27.50	0.2	2.4	2.4	0.1	2.78	0.07	1.10	1.14	3.45	65.00	18.85
25.00	0.2	2.4	2.4	0.1	2.65	0.07	1.10	1.15	3.35	65.00	19.43
22.50	0.2	2.4	2.4	0.1	2.46	0.07	1.10	1.17	3.20	65.00	20.33
20.00	0.2	2.3	2.3	0.1	2.28	0.07	1.10	1.19	3.12	65.00	20.86
20.00	0.2	2.3	2.3	0.1	2.28	0.07	0.99	1.20	3.11	65.00	20.88
17.50	0.2	2.3	2.3	0.1	1.95	0.07	0.99	1.22	2.89	65.00	22.50
15.00	0.2	2.2	2.2	0.1	1.58	0.07	0.99	1.23	2.67	65.00	24.32
12.50	0.2	2.2	2.2	0.0	1.73	0.07	0.99	1.25	2.81	65.00	23.17
10.00	0.2	2.1	2.1	0.0	2.08	0.07	0.99	1.27	3.00	65.00	21.67
7.00	0.2	2.0	2.0	0.0	3.11	0.07	0.99	1.29	3.74	65.00	17.36
7.00	0.2	2.0	2.0	0.0	3.11	0.07	0.88	1.30	3.69	65.00	17.61
5.00	0.2	2.0	2.0	0.0	4.14	0.07	0.88	1.31	4.61	65.00	14.10
2.50	0.2	1.9	1.9	0.0	5.46	0.07	0.88	1.33	5.85	65.00	11.11
0.00	0.2	1.8	1.8	0.0	6.84	0.07	0.88	1.35	7.17	65.00	9.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC1 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.8	1.8	0.0	1.30	0.14	0.88	1.06	2.21	65.00	29.35
37.50	0.2	1.9	1.9	0.0	1.88	0.14	0.88	1.04	2.54	65.00	25.54
35.00	0.2	2.0	2.0	0.1	2.41	0.14	0.88	1.03	2.98	65.00	21.84
33.00	0.2	2.0	2.0	0.1	2.78	0.14	0.88	1.01	3.30	65.00	19.69
33.00	0.2	2.0	2.0	0.1	2.78	0.14	0.99	1.03	3.36	65.00	19.35
30.00	0.2	2.1	2.1	0.1	2.80	0.14	0.99	1.03	3.38	65.00	19.25
27.50	0.2	2.2	2.2	0.1	2.76	0.14	0.99	1.04	3.33	65.00	19.50
25.00	0.2	2.2	2.2	0.1	2.65	0.14	0.99	1.05	3.24	65.00	20.08
22.50	0.2	2.3	2.3	0.1	2.48	0.14	0.99	1.07	3.09	65.00	21.04
20.00	0.2	2.3	2.3	0.1	2.30	0.14	0.99	1.08	2.90	65.00	22.39
20.00	0.2	2.3	2.3	0.1	2.30	0.14	1.10	1.31	3.12	65.00	20.83
17.50	0.2	2.4	2.4	0.1	2.03	0.14	1.10	1.33	2.96	65.00	21.97
15.00	0.2	2.4	2.4	0.1	1.72	0.14	1.10	1.35	2.80	65.00	23.24
12.50	0.2	2.4	2.4	0.0	1.93	0.14	1.10	1.36	2.94	65.00	22.12
10.00	0.2	2.5	2.5	0.0	2.25	0.14	1.10	1.38	3.17	65.00	20.52
7.00	0.2	2.5	2.5	0.0	3.25	0.14	1.10	1.40	3.79	65.00	17.15
7.00	0.2	2.5	2.5	0.0	3.26	0.14	1.21	1.63	3.95	65.00	16.47
5.00	0.2	2.5	2.5	0.0	4.30	0.14	1.21	1.65	4.83	65.00	13.47
2.50	0.2	2.5	2.5	0.0	5.66	0.14	1.21	1.67	6.06	65.00	10.73
0.00	0.2	2.5	2.5	0.0	7.07	0.14	1.21	1.68	7.41	65.00	8.77

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	732	2404	2513	442
60.00	144	-47	152	0	787	2408	2533	748
55.00	289	-96	304	0	846	2412	2556	1072
50.00	434	-148	459	0	908	2416	2581	1412
48.00	492	-171	521	0	933	2418	2592	1553
48.00	492	-171	521	0	933	2417	2591	1553
45.00	579	-205	614	0	973	2421	2610	1876
45.00	678	200	707	790	2671	12163	12453	-462
40.00	1408	38	1409	790	2739	12170	12474	95
35.00	2139	-127	2143	790	2797	12179	12496	699
32.00	2577	-229	2587	790	2841	12183	12510	1060
32.00	2493	-212	2502	780	1478	12472	12560	3220
30.00	2792	-248	2803	780	1508	12475	12566	3467
30.00	2792	-249	2804	780	1630	12476	12582	3920
25.00	3541	-349	3558	780	1702	12476	12592	4569
21.25	4103	-427	4125	780	1761	12480	12604	5061
21.25	4149	-378	4167	743	3689	12525	13057	6380
20.00	4337	-433	4359	743	3706	12520	13057	6561
15.00	5089	-658	5131	743	3783	12513	13072	7267
10.00	5840	-887	5907	743	3863	12503	13086	7999
5.00	6590	-1121	6684	743	3946	12490	13098	8757
0.00	7339	-1360	7464	743	4038	12491	13127	9517

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	722	2408	2514	433
60.00	145	-46	152	0	778	2414	2536	739
55.00	290	-95	305	0	837	2419	2560	1063
50.00	435	-147	459	0	898	2424	2586	1404
48.00	493	-169	521	0	924	2427	2597	1544
48.00	493	-169	521	0	924	2426	2596	1545
45.00	581	-203	615	0	963	2432	2616	1867
45.00	383	412	563	0	5807	19482	20330	-393
40.00	1552	62	1553	0	5875	19491	20358	182
35.00	2722	-293	2738	0	5947	19500	20386	787
32.00	3424	-508	3462	0	5991	19505	20404	1148
32.00	2902	74	2903	-1	5436	19012	19774	8038
30.00	3359	-57	3359	-1	5466	19016	19786	8285
30.00	3359	-59	3359	-1	5592	19011	19816	8749
25.00	4499	-396	4517	-1	5668	19003	19830	9414
21.25	5355	-653	5394	-1	5727	19009	19853	9905
21.25	5182	-185	5185	-2	4910	18963	19589	14546
20.00	5466	-259	5472	-2	4930	18945	19576	14739
15.00	6603	-557	6627	-2	5010	18916	19568	15467
10.00	7738	-860	7786	-2	5091	18882	19556	16222
5.00	8871	-1169	8948	-2	5175	18842	19540	17004
0.00	10002	-1482	10111	-2	5266	18843	19565	17763

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-1	1	0	713	2409	2513	441
60.00	145	-46	152	0	769	2414	2533	748
55.00	290	-94	304	0	828	2418	2556	1072
50.00	435	-145	459	0	889	2423	2581	1412
48.00	493	-167	521	0	915	2425	2592	1553
48.00	493	-167	521	0	915	2424	2591	1553
45.00	580	-200	614	0	954	2429	2610	1875
45.00	679	27	679	-791	2806	12175	12495	2137
40.00	1409	-143	1417	-791	2882	12179	12515	2705
35.00	2140	-319	2164	-791	2958	12181	12536	3299
32.00	2579	-426	2614	-791	3002	12186	12550	3660
32.00	2494	141	2498	-782	5425	12556	13678	8245
30.00	2795	11	2795	-782	5455	12559	13693	8491
30.00	2795	9	2795	-782	5585	12553	13740	8945
25.00	3548	-329	3564	-782	5666	12545	13765	9595
21.25	4113	-585	4154	-782	5726	12549	13793	10086
21.25	4159	-163	4162	-745	5047	12601	13575	13352
20.00	4348	-239	4355	-745	5069	12587	13570	13533
15.00	5103	-546	5132	-745	5154	12565	13581	14239
10.00	5857	-858	5920	-745	5239	12540	13590	14972
5.00	6610	-1175	6713	-745	5327	12512	13598	15731
0.00	7360	-1498	7511	-745	5418	12512	13635	16490

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-498	413	647	98	2431	8524	8864	-2315
37.50	-243	338	416	98	2553	8522	8896	-2320
35.00	13	259	260	98	2678	8520	8931	-2320
33.00	217	194	291	98	2776	8519	8960	-2321
33.00	217	194	291	98	1376	2442	2803	-917
30.00	305	142	336	98	1526	2440	2878	-917
27.50	378	94	390	98	1650	2439	2945	-916
25.00	451	43	454	98	1775	2438	3015	-915
22.50	525	-12	525	98	1899	2437	3090	-913
20.00	598	-71	602	98	2024	2436	3167	-911
20.00	598	-71	602	98	634	-3647	3702	472
17.50	488	-92	497	98	760	-3649	3728	469
15.00	379	-117	396	98	885	-3651	3757	467
12.50	269	-145	306	98	1011	-3653	3791	465
10.00	160	-177	239	98	1136	-3655	3828	465
7.00	28	-221	223	98	1287	-3657	3877	465
7.00	28	-221	223	98	-97	-9746	9747	1830
5.00	-206	-220	301	98	3	-9748	9748	1830
2.50	-498	-222	546	98	130	-9749	9750	1834
0.00	-791	-228	823	98	256	-9749	9753	1842

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-790	405	888	-99	2343	9739	10017	-1709
37.50	-498	333	599	-99	2469	9736	10044	-1718
35.00	-206	257	330	-99	2594	9734	10074	-1718
33.00	28	194	196	-100	2696	9732	10098	-1723
33.00	28	194	196	-100	1313	3658	3886	-289
30.00	159	144	215	-100	1464	3656	3938	-288
27.50	269	98	286	-100	1589	3654	3985	-287
25.00	378	49	382	-100	1715	3652	4035	-285
22.50	488	-5	488	-100	1841	3650	4088	-282
20.00	597	-62	601	-100	1966	3648	4145	-282
20.00	597	-62	601	-100	576	-2428	2496	1137
17.50	525	-81	531	-100	701	-2430	2529	1137
15.00	452	-104	463	-100	826	-2433	2569	1135
12.50	379	-131	401	-100	950	-2436	2615	1133
10.00	305	-161	345	-100	1074	-2439	2665	1132
7.00	218	-203	297	-100	1224	-2442	2731	1131
7.00	218	-203	297	-100	-177	-8522	8524	2525
5.00	13	-199	200	-100	-77	-8524	8524	2525
2.50	-243	-199	314	-99	43	-8525	8525	2529
0.00	-499	-202	538	-99	168	-8527	8528	2529

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	151	-2	151	260	-2225	-290	2244	2168
37.50	142	63	156	260	-2099	-293	2120	2168
35.00	133	124	182	260	-1974	-295	1996	2169
33.00	126	170	212	260	-1874	-298	1897	2169
33.00	133	170	216	145	-273	-318	420	2252
30.00	121	178	215	145	-122	-321	343	2252
27.50	111	179	211	145	4	-323	323	2252
25.00	102	177	205	145	129	-325	349	2252
22.50	92	172	195	145	255	-326	414	2252
20.00	82	162	182	145	380	-328	502	2252
20.00	88	162	185	30	1981	-345	2011	2332
17.50	78	101	128	30	2106	-346	2134	2332
15.00	68	36	77	30	2232	-348	2259	2331
12.50	57	-33	66	30	2357	-349	2383	2331
10.00	47	-106	115	30	2481	-351	2506	2331
7.00	34	-198	200	30	2632	-352	2655	2331
7.00	40	-197	201	-85	4231	-369	4247	2413
5.00	31	-300	302	-85	4330	-371	4346	2415
2.50	20	-432	432	-85	4453	-373	4469	2418
0.00	9	-567	567	-85	4578	-375	4593	2418

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	10	17	20	84	-2152	290	2172	1360
37.50	19	80	82	84	-2027	288	2047	1360
35.00	27	139	141	84	-1902	287	1923	1361
33.00	34	183	186	84	-1802	286	1824	1361
33.00	41	183	187	-31	-201	270	337	1444
30.00	50	187	194	-31	-51	268	273	1444
27.50	58	187	196	-31	75	267	277	1444
25.00	66	183	195	-31	200	265	332	1444
22.50	74	175	190	-31	325	264	419	1444
20.00	82	163	183	-31	451	262	522	1444
20.00	89	163	186	-146	2051	245	2066	1524
17.50	96	100	138	-146	2177	243	2190	1524
15.00	103	33	108	-146	2302	242	2315	1524
12.50	110	-38	117	-146	2427	238	2439	1524
10.00	118	-113	163	-146	2552	235	2563	1524
7.00	126	-208	243	-146	2702	234	2712	1524
7.00	132	-208	246	-261	4302	212	4307	1606
5.00	137	-312	341	-261	4401	208	4406	1608
2.50	143	-446	469	-261	4525	204	4530	1611
0.00	150	-584	603	-261	4650	202	4654	1612

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	55	40	68	86	-1338	-25	1338	-897
37.50	55	78	96	86	-1213	-27	1213	-897
35.00	54	113	125	86	-1088	-28	1088	-897
33.00	53	138	148	86	-988	-29	988	-897
33.00	54	137	147	73	-124	-37	130	-825
30.00	53	139	148	73	26	-39	47	-825
27.50	52	136	145	73	151	-40	156	-825
25.00	50	129	139	73	276	-41	279	-825
22.50	49	119	129	73	401	-42	403	-825
20.00	48	105	116	73	526	-43	527	-825
20.00	49	104	115	59	1390	-50	1391	-755
17.50	47	61	77	59	1515	-51	1516	-755
15.00	46	13	48	59	1640	-52	1641	-756
12.50	44	-38	58	59	1765	-53	1766	-756
10.00	43	-92	102	59	1890	-53	1891	-756
7.00	41	-163	168	59	2040	-54	2041	-755
7.00	42	-164	170	46	2905	-61	2905	-684
5.00	40	-235	239	46	3005	-62	3005	-684
2.50	39	-327	329	46	3130	-62	3131	-683
0.00	37	-423	425	46	3255	-63	3256	-681

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	37	49	61	-47	-1310	49	1311	-1931
37.50	38	86	94	-47	-1185	48	1186	-1930
35.00	40	120	126	-47	-1060	47	1061	-1930
33.00	41	144	150	-47	-960	47	961	-1930
33.00	42	143	149	-60	-97	40	105	-1858
30.00	44	144	150	-60	53	39	66	-1858
27.50	45	140	147	-60	178	38	182	-1858
25.00	46	133	141	-60	302	37	305	-1858
22.50	47	122	131	-60	427	36	429	-1859
20.00	48	107	118	-60	552	35	553	-1859
20.00	49	106	117	-73	1416	28	1416	-1788
17.50	50	62	80	-73	1541	27	1541	-1788
15.00	51	14	53	-73	1666	26	1666	-1789
12.50	51	-38	64	-73	1791	24	1791	-1789
10.00	52	-94	107	-73	1916	23	1916	-1789
7.00	53	-165	174	-73	2067	22	2067	-1789
7.00	54	-166	175	-87	2931	13	2931	-1717
5.00	54	-238	244	-87	3031	12	3031	-1717
2.50	55	-331	335	-87	3157	11	3157	-1716
0.00	55	-427	431	-87	3283	9	3283	-1714

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	7.4	7.5	0.0	0.01	0.03	0.00	0.29	0.50	65.00	99.90
60.00	0.8	6.6	6.6	0.0	1.46	0.04	0.00	0.28	1.50	65.00	43.33
55.00	0.7	5.7	5.7	0.0	2.64	0.06	0.00	0.26	2.69	65.00	24.16
50.00	0.6	4.9	4.9	0.0	3.59	0.07	0.00	0.25	3.66	65.00	17.76
48.00	0.6	4.5	4.6	0.0	3.92	0.07	0.00	0.25	4.00	65.00	16.27
48.00	0.6	4.5	4.6	0.0	2.65	0.05	0.00	0.17	2.70	65.00	24.05
45.00	0.5	4.1	4.1	0.0	2.95	0.06	0.00	0.16	3.01	65.00	21.57
45.00	0.5	4.1	4.1	0.0	3.41	0.01	1.86	2.65	5.31	65.00	12.25
40.00	0.5	3.3	3.3	0.0	6.04	0.00	1.70	2.45	7.00	65.00	9.29
35.00	0.4	2.6	2.6	0.0	8.47	0.02	1.56	2.28	8.93	65.00	7.28
32.00	0.3	2.2	2.2	0.0	9.78	0.03	1.48	2.19	10.15	65.00	6.40
32.00	0.3	2.2	2.2	0.0	9.45	0.09	1.46	2.17	9.92	65.00	6.55
30.00	0.3	1.9	1.9	0.0	10.25	0.10	1.42	2.11	10.68	65.00	6.09
30.00	0.3	1.9	1.9	0.0	10.25	0.11	1.42	2.11	10.69	65.00	6.08
25.00	0.2	1.4	1.4	0.0	12.03	0.12	1.31	1.97	12.39	65.00	5.25
21.25	0.2	1.0	1.0	0.0	13.17	0.13	1.23	1.88	13.49	65.00	4.82
21.25	0.2	1.0	1.0	0.0	13.27	0.16	1.17	1.85	13.59	65.00	4.78
20.00	0.1	0.9	0.9	0.0	13.65	0.17	1.15	1.82	13.95	65.00	4.66
15.00	0.1	0.5	0.5	0.0	14.98	0.18	1.07	1.72	15.26	65.00	4.26
10.00	0.0	0.2	0.2	0.0	16.09	0.19	1.00	1.62	16.37	65.00	3.97
5.00	0.0	0.1	0.1	0.0	17.03	0.20	0.93	1.53	17.30	65.00	3.76
0.00	0.0	0.0	0.0	0.0	17.81	0.21	0.87	1.46	18.07	65.00	3.60

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	9.5	9.6	0.1	0.01	0.02	0.00	0.29	0.51	65.00	99.90
60.00	0.8	8.4	8.5	0.1	1.46	0.04	0.00	0.28	1.50	65.00	43.30
55.00	0.7	7.4	7.4	0.1	2.64	0.05	0.00	0.27	2.69	65.00	24.13
50.00	0.6	6.3	6.4	0.0	3.60	0.07	0.00	0.25	3.66	65.00	17.74
48.00	0.6	5.9	5.9	0.0	3.93	0.07	0.00	0.25	4.00	65.00	16.24
48.00	0.6	5.9	5.9	0.0	2.66	0.05	0.00	0.17	2.71	65.00	24.02
45.00	0.5	5.3	5.3	0.0	2.96	0.06	0.00	0.16	3.02	65.00	21.54
45.00	0.5	5.3	5.3	0.0	2.71	0.01	0.00	1.28	3.36	65.00	19.35
40.00	0.5	4.3	4.3	0.0	6.67	0.01	0.00	1.23	6.77	65.00	9.60
35.00	0.4	3.4	3.4	0.0	10.92	0.02	0.00	1.18	10.94	65.00	5.94
32.00	0.3	2.9	2.9	0.0	13.20	0.03	0.00	1.15	13.23	65.00	4.91
32.00	0.3	2.9	2.9	0.0	10.83	0.22	0.00	1.12	11.10	65.00	5.86
30.00	0.3	2.5	2.6	0.0	12.10	0.23	0.00	1.10	12.33	65.00	5.27
30.00	0.3	2.5	2.6	0.0	12.10	0.24	0.00	1.10	12.34	65.00	5.27
25.00	0.2	1.8	1.8	0.0	15.24	0.25	0.00	1.06	15.49	65.00	4.20
21.25	0.2	1.3	1.3	0.0	17.27	0.25	0.00	1.03	17.52	65.00	3.71
21.25	0.2	1.3	1.3	0.0	16.34	0.37	0.00	1.02	16.71	65.00	3.89
20.00	0.1	1.2	1.2	0.0	16.96	0.37	0.00	1.01	17.34	65.00	3.75
15.00	0.1	0.7	0.7	0.0	19.21	0.38	0.00	0.97	19.59	65.00	3.32
10.00	0.0	0.3	0.3	0.0	21.10	0.38	0.00	0.94	21.48	65.00	3.03
5.00	0.0	0.1	0.1	0.0	22.70	0.39	0.00	0.90	23.08	65.00	2.82
0.00	0.0	0.0	0.0	0.0	24.04	0.39	0.00	0.87	24.43	65.00	2.66

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	7.4	7.5	0.0	0.01	0.03	0.00	0.29	0.50	65.00	99.90
60.00	0.9	6.6	6.6	0.0	1.46	0.04	0.00	0.28	1.50	65.00	43.31
55.00	0.7	5.7	5.8	0.0	2.64	0.06	0.00	0.27	2.69	65.00	24.15
50.00	0.6	4.9	4.9	0.0	3.59	0.07	0.00	0.25	3.66	65.00	17.75
48.00	0.6	4.6	4.6	0.0	3.92	0.07	0.00	0.25	4.00	65.00	16.26
48.00	0.6	4.6	4.6	0.0	2.65	0.05	0.00	0.17	2.70	65.00	24.04
45.00	0.5	4.1	4.1	0.0	2.96	0.06	0.00	0.16	3.01	65.00	21.56
45.00	0.5	4.1	4.1	0.0	3.20	0.07	1.86	2.65	5.06	65.00	12.85
40.00	0.4	3.3	3.3	0.0	6.16	0.08	1.70	2.45	6.91	65.00	9.41
35.00	0.4	2.6	2.6	0.0	8.68	0.09	1.56	2.28	9.17	65.00	7.09
32.00	0.3	2.2	2.2	0.0	9.98	0.10	1.48	2.19	10.40	65.00	6.25
32.00	0.3	2.2	2.2	0.0	9.38	0.23	1.47	2.23	10.19	65.00	6.38
30.00	0.3	1.9	1.9	0.0	10.03	0.23	1.42	2.17	10.78	65.00	6.03
30.00	0.3	1.9	1.9	0.0	10.03	0.25	1.42	2.18	10.79	65.00	6.02
25.00	0.2	1.4	1.4	0.0	12.04	0.25	1.31	2.04	12.54	65.00	5.19
21.25	0.2	1.0	1.0	0.0	13.33	0.26	1.24	1.95	13.79	65.00	4.71
21.25	0.2	1.0	1.0	0.0	13.12	0.34	1.18	1.88	13.64	65.00	4.76
20.00	0.1	0.9	0.9	0.0	13.52	0.34	1.16	1.85	14.03	65.00	4.63
15.00	0.1	0.5	0.5	0.0	14.93	0.35	1.07	1.74	15.41	65.00	4.22
10.00	0.0	0.2	0.2	0.0	16.12	0.35	1.00	1.64	16.58	65.00	3.92
5.00	0.0	0.1	0.1	0.0	17.11	0.36	0.93	1.56	17.56	65.00	3.70
0.00	0.0	0.0	0.0	0.0	17.94	0.36	0.87	1.48	18.38	65.00	3.54

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	5.3	5.3	0.0	9.84	0.16	0.75	1.98	10.12	65.00	6.43
37.50	0.5	5.3	5.3	0.1	6.44	0.16	0.75	1.99	7.24	65.00	8.98
35.00	0.5	5.3	5.4	0.1	3.89	0.16	0.75	1.99	5.32	65.00	12.23
33.00	0.5	5.4	5.4	0.1	4.37	0.16	0.75	2.00	5.54	65.00	11.73
33.00	0.5	5.4	5.4	0.1	4.37	0.06	0.75	1.14	4.80	65.00	13.54
30.00	0.5	5.4	5.4	0.1	5.35	0.06	0.75	1.15	5.72	65.00	11.36
27.50	0.5	5.4	5.4	0.1	6.13	0.06	0.75	1.16	6.48	65.00	10.03
25.00	0.5	5.4	5.4	0.0	6.90	0.06	0.75	1.17	7.22	65.00	9.00
22.50	0.5	5.3	5.3	0.0	7.79	0.06	0.75	1.18	7.99	65.00	8.13
20.00	0.5	5.2	5.3	0.0	9.22	0.06	0.75	1.19	9.41	65.00	6.91
20.00	0.5	5.2	5.3	0.0	9.22	0.03	0.75	1.27	9.36	65.00	6.94
17.50	0.5	5.1	5.2	0.0	7.74	0.03	0.75	1.27	7.92	65.00	8.21
15.00	0.5	5.0	5.0	0.0	6.28	0.03	0.75	1.28	6.51	65.00	9.98
12.50	0.5	4.9	4.9	-0.1	4.84	0.03	0.75	1.28	5.16	65.00	12.60
10.00	0.5	4.7	4.7	-0.1	3.58	0.03	0.75	1.28	4.19	65.00	15.53
7.00	0.5	4.5	4.5	-0.1	3.42	0.03	0.75	1.29	4.06	65.00	16.01
7.00	0.5	4.5	4.5	-0.1	3.42	0.12	0.75	2.11	4.83	65.00	13.46
5.00	0.5	4.4	4.4	0.0	4.49	0.12	0.75	2.11	5.58	65.00	11.66
2.50	0.5	4.2	4.2	0.0	8.68	0.12	0.75	2.11	8.82	65.00	7.37
0.00	0.5	4.1	4.1	0.0	13.01	0.13	0.75	2.11	13.14	65.00	4.95

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	4.1	4.1	0.0	14.09	0.12	0.76	2.16	14.23	65.00	4.57
37.50	0.5	4.2	4.2	0.1	9.35	0.12	0.76	2.16	9.52	65.00	6.83
35.00	0.5	4.4	4.4	0.1	5.04	0.12	0.76	2.16	5.90	65.00	11.02
33.00	0.5	4.5	4.5	0.1	3.02	0.12	0.76	2.17	4.73	65.00	13.74
33.00	0.5	4.5	4.5	0.1	3.02	0.02	0.76	1.30	3.75	65.00	17.32
30.00	0.5	4.7	4.7	0.1	3.22	0.02	0.76	1.31	3.83	65.00	16.97
27.50	0.5	4.9	4.9	0.1	4.55	0.02	0.76	1.32	4.96	65.00	13.11
25.00	0.5	5.0	5.0	0.0	5.86	0.02	0.76	1.32	6.19	65.00	10.51
22.50	0.5	5.1	5.2	0.0	7.20	0.02	0.76	1.33	7.42	65.00	8.76
20.00	0.5	5.2	5.3	0.0	9.16	0.02	0.76	1.34	9.26	65.00	7.02
20.00	0.5	5.2	5.3	0.0	9.16	0.08	0.76	1.11	9.39	65.00	6.92
17.50	0.5	5.3	5.3	0.0	8.21	0.08	0.76	1.11	8.46	65.00	7.69
15.00	0.5	5.3	5.4	0.0	7.27	0.08	0.76	1.12	7.55	65.00	8.61
12.50	0.5	5.4	5.4	0.0	6.36	0.08	0.76	1.13	6.67	65.00	9.74
10.00	0.5	5.4	5.4	0.0	5.47	0.08	0.76	1.13	5.83	65.00	11.15
7.00	0.5	5.4	5.4	0.0	4.43	0.08	0.76	1.14	4.86	65.00	13.37
7.00	0.5	5.4	5.4	0.0	4.43	0.17	0.76	1.95	5.50	65.00	11.81
5.00	0.5	5.3	5.4	0.0	3.01	0.17	0.76	1.95	4.59	65.00	14.16
2.50	0.5	5.3	5.3	0.0	4.78	0.17	0.76	1.95	5.59	65.00	11.62
0.00	0.5	5.3	5.3	0.0	8.56	0.17	0.76	1.95	8.97	65.00	7.24

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.9	2.9	0.0	2.23	0.15	2.00	2.31	4.64	65.00	14.00
37.50	0.3	2.9	2.9	0.1	2.47	0.15	2.00	2.29	4.74	65.00	13.71
35.00	0.3	2.9	2.9	0.1	2.72	0.15	2.00	2.27	4.86	65.00	13.38
33.00	0.3	2.8	2.9	0.1	3.27	0.15	2.00	2.26	5.04	65.00	12.91
33.00	0.3	2.8	2.9	0.1	3.31	0.15	1.11	1.17	4.01	65.00	16.19
30.00	0.3	2.8	2.8	0.1	3.35	0.15	1.11	1.16	4.04	65.00	16.10
27.50	0.3	2.8	2.8	0.2	3.32	0.15	1.11	1.16	4.00	65.00	16.23
25.00	0.3	2.7	2.8	0.2	3.23	0.15	1.11	1.16	3.92	65.00	16.57
22.50	0.3	2.7	2.7	0.1	3.08	0.15	1.11	1.17	3.79	65.00	17.14
20.00	0.3	2.7	2.7	0.1	2.88	0.15	1.11	1.18	3.62	65.00	17.97
20.00	0.3	2.7	2.7	0.1	2.92	0.16	0.23	0.51	3.10	65.00	20.99
17.50	0.3	2.6	2.6	0.1	1.96	0.16	0.23	0.53	2.14	65.00	30.42
15.00	0.3	2.6	2.6	0.1	1.21	0.16	0.23	0.55	1.37	65.00	47.33
12.50	0.3	2.5	2.5	0.1	1.04	0.16	0.23	0.56	1.30	65.00	49.93
10.00	0.3	2.4	2.5	0.0	1.84	0.16	0.23	0.58	2.00	65.00	32.56
7.00	0.3	2.4	2.4	0.0	3.11	0.16	0.23	0.60	3.27	65.00	19.87
7.00	0.3	2.4	2.4	0.0	3.15	0.16	0.65	1.24	3.68	65.00	17.67
5.00	0.3	2.3	2.3	0.0	4.60	0.16	0.65	1.26	5.03	65.00	12.92
2.50	0.3	2.2	2.3	0.0	6.47	0.16	0.65	1.27	6.83	65.00	9.51
0.00	0.3	2.2	2.2	0.0	8.40	0.16	0.65	1.29	8.71	65.00	7.46

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.2	2.2	0.0	0.31	0.09	0.65	0.95	1.66	65.00	39.23
37.50	0.3	2.2	2.3	0.1	1.29	0.09	0.65	0.93	1.86	65.00	35.03
35.00	0.3	2.3	2.3	0.1	2.21	0.09	0.65	0.91	2.61	65.00	24.93
33.00	0.3	2.4	2.4	0.1	2.90	0.09	0.65	0.90	3.23	65.00	20.11
33.00	0.3	2.4	2.4	0.1	2.94	0.10	0.24	0.28	3.07	65.00	21.19
30.00	0.3	2.4	2.5	0.1	3.06	0.10	0.24	0.28	3.19	65.00	20.35
27.50	0.3	2.5	2.5	0.2	3.11	0.10	0.24	0.28	3.24	65.00	20.07
25.00	0.3	2.6	2.6	0.2	3.09	0.10	0.24	0.28	3.23	65.00	20.13
22.50	0.3	2.6	2.6	0.2	3.03	0.10	0.24	0.30	3.16	65.00	20.55
20.00	0.3	2.7	2.7	0.1	2.90	0.10	0.24	0.31	3.04	65.00	21.35
20.00	0.3	2.7	2.7	0.1	2.94	0.10	1.12	1.41	3.74	65.00	17.36
17.50	0.3	2.7	2.7	0.1	2.05	0.10	1.12	1.42	3.24	65.00	20.07
15.00	0.3	2.7	2.8	0.1	1.71	0.10	1.12	1.44	3.07	65.00	21.17
12.50	0.3	2.8	2.8	0.1	1.86	0.10	1.12	1.46	3.14	65.00	20.67
10.00	0.3	2.8	2.8	0.0	2.42	0.10	1.12	1.48	3.54	65.00	18.36
7.00	0.3	2.8	2.9	0.0	3.82	0.10	1.12	1.50	4.47	65.00	14.55
7.00	0.3	2.8	2.9	0.0	3.86	0.11	2.00	2.60	5.54	65.00	11.74
5.00	0.3	2.9	2.9	0.0	5.43	0.11	2.00	2.62	6.73	65.00	9.66
2.50	0.3	2.9	2.9	0.0	7.43	0.11	2.00	2.63	8.46	65.00	7.68
0.00	0.3	2.9	2.9	0.0	9.49	0.11	2.00	2.65	10.35	65.00	6.28

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.3	1.3	0.0	1.06	0.06	0.66	0.85	1.75	65.00	37.04
37.50	0.2	1.3	1.3	0.0	1.49	0.06	0.66	0.83	1.90	65.00	34.17
35.00	0.2	1.3	1.3	0.1	1.99	0.06	0.66	0.81	2.30	65.00	28.30
33.00	0.2	1.3	1.3	0.1	2.35	0.06	0.66	0.80	2.63	65.00	24.74
33.00	0.2	1.3	1.3	0.1	2.34	0.06	0.56	0.58	2.58	65.00	25.23
30.00	0.2	1.3	1.3	0.1	2.36	0.06	0.56	0.56	2.60	65.00	25.02
27.50	0.2	1.3	1.3	0.1	2.31	0.06	0.56	0.58	2.56	65.00	25.40
25.00	0.2	1.3	1.3	0.1	2.21	0.06	0.56	0.60	2.47	65.00	26.32
22.50	0.2	1.2	1.3	0.1	2.05	0.06	0.56	0.61	2.33	65.00	27.87
20.00	0.2	1.2	1.2	0.1	1.84	0.06	0.56	0.63	2.15	65.00	30.27
20.00	0.2	1.2	1.2	0.1	1.83	0.05	0.45	0.65	2.09	65.00	31.11
17.50	0.2	1.2	1.2	0.1	1.18	0.05	0.45	0.67	1.58	65.00	41.04
15.00	0.2	1.2	1.2	0.0	0.76	0.05	0.45	0.68	1.40	65.00	46.28
12.50	0.2	1.2	1.2	0.0	0.88	0.05	0.45	0.70	1.51	65.00	43.09
10.00	0.2	1.1	1.1	0.0	1.62	0.05	0.45	0.72	1.93	65.00	33.62
7.00	0.2	1.1	1.1	0.0	2.65	0.05	0.45	0.74	2.87	65.00	22.62
7.00	0.2	1.1	1.1	0.0	2.67	0.05	0.35	0.76	2.86	65.00	22.74
5.00	0.2	1.1	1.1	0.0	3.70	0.05	0.35	0.77	3.86	65.00	16.85
2.50	0.2	1.0	1.0	0.0	5.04	0.05	0.35	0.79	5.17	65.00	12.57
0.00	0.2	1.0	1.0	0.0	6.44	0.05	0.35	0.81	6.55	65.00	9.92

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4TC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.0	1.0	0.0	0.94	0.13	0.36	0.54	1.33	65.00	48.91
37.50	0.2	1.0	1.0	0.0	1.50	0.13	0.36	0.52	1.78	65.00	36.44
35.00	0.2	1.1	1.1	0.1	2.01	0.13	0.36	0.51	2.25	65.00	28.88
33.00	0.2	1.1	1.1	0.1	2.37	0.13	0.36	0.49	2.60	65.00	25.04
33.00	0.2	1.1	1.1	0.1	2.36	0.13	0.46	0.47	2.61	65.00	24.91
30.00	0.2	1.1	1.1	0.1	2.38	0.13	0.46	0.47	2.62	65.00	24.76
27.50	0.2	1.2	1.2	0.1	2.34	0.13	0.46	0.49	2.58	65.00	25.20
25.00	0.2	1.2	1.2	0.1	2.24	0.13	0.46	0.50	2.48	65.00	26.19
22.50	0.2	1.2	1.2	0.1	2.08	0.13	0.46	0.52	2.33	65.00	27.88
20.00	0.2	1.2	1.2	0.1	1.87	0.13	0.46	0.54	2.13	65.00	30.51
20.00	0.2	1.2	1.2	0.1	1.86	0.12	0.56	0.76	2.15	65.00	30.18
17.50	0.2	1.2	1.3	0.1	1.22	0.12	0.56	0.78	1.65	65.00	39.40
15.00	0.2	1.3	1.3	0.0	0.83	0.12	0.56	0.80	1.52	65.00	42.67
12.50	0.2	1.3	1.3	0.0	0.99	0.12	0.56	0.81	1.62	65.00	40.09
10.00	0.2	1.3	1.3	0.0	1.69	0.12	0.56	0.83	1.98	65.00	32.76
7.00	0.2	1.3	1.3	0.0	2.75	0.12	0.56	0.85	2.98	65.00	21.82
7.00	0.2	1.3	1.3	0.0	2.77	0.12	0.66	1.07	3.02	65.00	21.50
5.00	0.2	1.3	1.3	0.0	3.83	0.12	0.66	1.09	4.04	65.00	16.09
2.50	0.2	1.3	1.3	0.0	5.20	0.12	0.66	1.11	5.38	65.00	12.08
0.00	0.2	1.3	1.3	0.0	6.62	0.12	0.66	1.12	6.79	65.00	9.58

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	711	2426	2528	439
60.00	149	-43	155	0	711	2486	2585	745
55.00	300	-85	312	0	712	2548	2646	1069
50.00	455	-128	472	0	712	2614	2710	1410
48.00	518	-145	538	0	713	2642	2736	1550
48.00	518	-145	538	0	713	2641	2736	1551
45.00	614	-171	637	0	713	2685	2778	1873
45.00	717	190	742	811	2579	12709	12968	-290
40.00	1482	35	1482	811	2580	12784	13041	268
35.00	2251	-119	2254	811	2566	12863	13117	874
32.00	2715	-211	2723	811	2567	12911	13164	1235
32.00	2635	-240	2646	822	996	13551	13588	3587
30.00	2961	-264	2973	822	996	13584	13620	3833
30.00	2963	-264	2974	822	992	13710	13745	4287
25.00	3788	-323	3802	822	986	13786	13821	4939
21.25	4410	-367	4425	822	987	13850	13885	5431
21.25	4458	-362	4473	804	2683	14196	14448	6925
20.00	4672	-402	4689	804	2679	14210	14461	7109
15.00	5527	-562	5555	804	2673	14284	14532	7820
10.00	6387	-722	6427	804	2667	14357	14602	8557
5.00	7251	-882	7304	804	2661	14429	14673	9321
0.00	8119	-1042	8186	804	2661	14521	14763	10080

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	701	2430	2529	430
60.00	149	-42	155	0	701	2491	2588	736
55.00	300	-84	312	0	701	2555	2650	1060
50.00	456	-126	473	0	702	2622	2715	1401
48.00	519	-143	538	0	702	2650	2742	1541
48.00	519	-143	538	0	702	2650	2741	1542
45.00	615	-168	638	0	702	2695	2785	1864
45.00	409	357	543	-1	5249	20155	20827	-422
40.00	1620	42	1621	-1	5250	20232	20902	155
35.00	2837	-273	2850	-1	5250	20311	20979	762
32.00	3569	-462	3598	-1	5251	20361	21027	1123
32.00	3038	27	3038	-3	4589	20445	20953	8008
30.00	3529	-83	3530	-3	4589	20478	20986	8254
30.00	3531	-83	3532	-3	4589	20599	21104	8719
25.00	4769	-359	4783	-3	4589	20667	21170	9389
21.25	5701	-565	5728	-3	4589	20732	21234	9881
21.25	5516	-185	5519	-3	3800	21299	21636	14519
20.00	5836	-242	5841	-3	3799	21300	21636	14717
15.00	7116	-470	7132	-3	3797	21351	21686	15453
10.00	8400	-697	8429	-3	3794	21399	21733	16218
5.00	9687	-925	9731	-3	3790	21445	21777	17010
0.00	10976	-1153	11037	-3	3791	21537	21868	17770

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	1	0	1	0	691	2431	2528	439
60.00	149	-41	155	0	691	2491	2585	745
55.00	300	-83	312	0	691	2554	2646	1069
50.00	456	-124	472	0	691	2620	2710	1410
48.00	519	-141	538	0	691	2647	2736	1550
48.00	519	-141	538	0	691	2647	2736	1551
45.00	615	-166	637	0	692	2691	2778	1873
45.00	718	14	718	-813	2674	12726	13004	1932
40.00	1484	-146	1491	-813	2683	12797	13075	2501
35.00	2254	-307	2275	-813	2689	12871	13149	3096
32.00	2718	-404	2748	-813	2689	12919	13196	3458
32.00	2638	115	2640	-825	4937	13558	14429	7845
30.00	2964	-3	2964	-825	4937	13590	14459	8091
30.00	2966	-3	2966	-825	4942	13710	14573	8546
25.00	3791	-300	3802	-825	4947	13778	14639	9198
21.25	4412	-523	4443	-825	4947	13841	14699	9690
21.25	4461	-144	4463	-808	4045	14183	14749	12780
20.00	4674	-205	4678	-808	4048	14189	14755	12963
15.00	5528	-448	5546	-808	4052	14249	14814	13674
10.00	6385	-692	6423	-808	4053	14308	14871	14412
5.00	7246	-936	7306	-808	4054	14367	14928	15176
0.00	8111	-1179	8196	-808	4054	14459	15017	15935

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-500	369	621	103	2256	8726	9013	-2183
37.50	-239	299	383	103	2377	8693	9012	-2188
35.00	21	226	227	103	2502	8660	9014	-2188
33.00	229	165	282	103	2599	8634	9017	-2189
33.00	229	165	282	103	1192	2559	2823	-784
30.00	320	119	342	103	1341	2519	2854	-784
27.50	395	77	403	103	1465	2487	2887	-783
25.00	470	31	471	103	1588	2456	2925	-780
22.50	543	-18	543	103	1713	2423	2968	-780
20.00	615	-71	619	103	1837	2392	3016	-778
20.00	615	-71	619	103	440	-3691	3717	604
17.50	504	-86	511	103	565	-3724	3766	601
15.00	392	-105	405	103	691	-3757	3820	599
12.50	278	-128	306	103	816	-3790	3876	597
10.00	164	-154	225	103	942	-3822	3937	596
7.00	26	-191	192	103	1091	-3861	4013	596
7.00	26	-191	192	103	-299	-9949	9954	1960
5.00	-213	-185	282	103	-199	-9976	9978	1960
2.50	-513	-181	544	103	-73	-10008	10008	1964
0.00	-813	-180	833	103	53	-10038	10039	1972

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-811	361	888	-104	2168	10022	10253	-1876
37.50	-511	294	589	-104	2294	9987	10247	-1886
35.00	-212	223	308	-104	2419	9954	10244	-1886
33.00	27	164	166	-104	2520	9927	10242	-1890
33.00	27	164	166	-104	1131	3855	4017	-455
30.00	165	121	204	-104	1281	3815	4025	-454
27.50	279	80	290	-104	1407	3782	4036	-453
25.00	392	36	394	-104	1532	3750	4051	-450
22.50	504	-12	504	-104	1657	3717	4069	-450
20.00	615	-63	618	-104	1782	3684	4092	-447
20.00	615	-63	618	-104	385	-2390	2421	973
17.50	543	-77	548	-104	510	-2423	2476	973
15.00	469	-94	479	-104	634	-2457	2538	971
12.50	395	-115	412	-104	757	-2491	2604	969
10.00	320	-139	349	-104	881	-2525	2674	967
7.00	228	-174	287	-104	1030	-2565	2764	966
7.00	228	-174	287	-104	-378	-8643	8651	2360
5.00	21	-166	167	-104	-278	-8670	8674	2360
2.50	-240	-159	288	-104	-159	-8702	8703	2364
0.00	-502	-157	525	-104	-34	-8735	8735	2364

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	135	-48	143	265	-2416	39	2416	2238
37.50	136	22	137	265	-2291	4	2291	2238
35.00	135	89	162	265	-2166	-30	2166	2239
33.00	134	140	194	265	-2066	-56	2067	2239
33.00	134	140	194	150	-466	-111	479	2240
30.00	130	154	201	150	-316	-150	350	2240
27.50	125	162	204	150	-191	-183	264	2241
25.00	119	166	204	150	-65	-216	226	2241
22.50	112	166	200	150	60	-249	256	2240
20.00	104	162	192	150	185	-281	337	2240
20.00	104	162	193	35	1785	-332	1816	2239
17.50	93	107	142	35	1910	-365	1944	2239
15.00	82	48	95	35	2035	-397	2073	2239
12.50	69	-15	71	35	2160	-430	2202	2238
10.00	56	-82	99	35	2284	-462	2331	2238
7.00	39	-167	171	35	2434	-501	2485	2238
7.00	39	-167	171	-80	4033	-551	4070	2238
5.00	25	-265	266	-80	4132	-578	4172	2240
2.50	7	-390	390	-80	4255	-611	4298	2243
0.00	-12	-520	520	-80	4380	-643	4427	2243

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-11	-29	31	80	-2342	640	2428	1568
37.50	8	39	40	80	-2218	608	2300	1568
35.00	26	104	107	80	-2093	575	2170	1568
33.00	39	153	158	80	-1993	549	2067	1568
33.00	39	153	157	-35	-393	499	635	1570
30.00	56	164	173	-35	-243	460	520	1571
27.50	70	169	183	-35	-118	428	444	1571
25.00	82	171	190	-35	7	395	396	1571
22.50	94	169	193	-35	132	363	386	1571
20.00	104	163	193	-35	257	330	419	1571
20.00	104	163	193	-150	1857	279	1878	1570
17.50	112	105	154	-150	1982	246	1998	1569
15.00	119	44	127	-150	2107	213	2118	1569
12.50	125	-21	126	-150	2232	179	2239	1569
10.00	129	-90	158	-150	2357	145	2361	1569
7.00	134	-178	222	-150	2506	106	2508	1569
7.00	134	-178	222	-266	4105	51	4105	1569
5.00	135	-277	308	-266	4204	22	4204	1571
2.50	135	-405	427	-266	4328	-13	4328	1574
0.00	134	-537	554	-266	4452	-46	4453	1574

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	34	-3	34	92	-1510	288	1537	-908
37.50	42	40	58	92	-1386	255	1409	-908
35.00	49	80	94	92	-1261	223	1281	-908
33.00	54	109	122	92	-1161	197	1178	-907
33.00	54	109	122	78	-298	153	335	-907
30.00	59	117	131	78	-148	115	187	-907
27.50	62	120	135	78	-24	83	86	-907
25.00	64	119	135	78	101	51	113	-907
22.50	65	114	131	78	226	19	226	-907
20.00	65	105	123	78	350	-13	351	-907
20.00	65	105	123	63	1214	-56	1215	-907
17.50	63	67	92	63	1339	-88	1342	-907
15.00	60	25	65	63	1463	-120	1468	-908
12.50	56	-21	59	63	1588	-152	1595	-908
10.00	51	-71	87	63	1713	-183	1723	-908
7.00	43	-135	142	63	1863	-221	1876	-908
7.00	43	-135	142	49	2727	-263	2740	-907
5.00	37	-202	205	49	2827	-289	2842	-907
2.50	28	-288	290	49	2952	-321	2969	-907
0.00	17	-379	379	49	3077	-352	3097	-905

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	18	5	19	-49	-1483	351	1524	-1700
37.50	28	48	55	-49	-1358	320	1395	-1700
35.00	37	87	94	-49	-1233	288	1266	-1699
33.00	44	115	123	-49	-1133	263	1163	-1699
33.00	44	115	123	-63	-270	220	348	-1699
30.00	51	122	132	-63	-120	182	218	-1698
27.50	56	124	136	-63	4	150	150	-1698
25.00	60	122	136	-63	129	118	175	-1698
22.50	63	116	132	-63	253	86	268	-1698
20.00	65	107	125	-63	378	55	382	-1698
20.00	65	107	125	-78	1241	11	1241	-1699
17.50	65	68	94	-78	1366	-21	1366	-1699
15.00	64	25	68	-78	1491	-53	1491	-1699
12.50	62	-22	66	-78	1615	-85	1618	-1699
10.00	59	-72	93	-78	1740	-117	1744	-1699
7.00	54	-138	148	-78	1890	-156	1896	-1699
7.00	54	-138	148	-92	2754	-200	2761	-1699
5.00	49	-205	211	-92	2854	-226	2863	-1698
2.50	41	-292	295	-92	2979	-258	2990	-1698
0.00	33	-384	385	-92	3105	-291	3118	-1697

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	8.0	8.1	0.1	0.01	0.03	0.00	0.29	0.51	65.00	99.90
60.00	0.7	7.1	7.1	0.0	1.49	0.04	0.00	0.28	1.53	65.00	42.50
55.00	0.6	6.2	6.2	0.0	2.70	0.05	0.00	0.27	2.76	65.00	23.58
50.00	0.5	5.3	5.3	0.0	3.71	0.07	0.00	0.27	3.78	65.00	17.22
48.00	0.5	4.9	5.0	0.0	4.06	0.07	0.00	0.27	4.13	65.00	15.72
48.00	0.5	4.9	5.0	0.0	2.75	0.05	0.00	0.18	2.80	65.00	23.25
45.00	0.5	4.4	4.4	0.0	3.07	0.06	0.00	0.18	3.13	65.00	20.76
45.00	0.5	4.4	4.4	0.0	3.58	0.01	1.91	2.73	5.46	65.00	11.91
40.00	0.4	3.6	3.6	0.0	6.35	0.01	1.74	2.53	7.30	65.00	8.90
35.00	0.3	2.8	2.8	0.0	8.90	0.02	1.60	2.36	9.37	65.00	6.94
32.00	0.3	2.4	2.4	0.0	10.27	0.03	1.52	2.26	10.66	65.00	6.10
32.00	0.3	2.4	2.4	0.0	10.01	0.10	1.54	2.30	10.52	65.00	6.18
30.00	0.2	2.1	2.1	0.0	10.87	0.11	1.49	2.24	11.34	65.00	5.73
30.00	0.2	2.1	2.1	0.0	10.88	0.12	1.49	2.25	11.36	65.00	5.72
25.00	0.2	1.5	1.5	0.0	12.82	0.13	1.38	2.11	13.22	65.00	4.92
21.25	0.1	1.1	1.1	0.0	14.08	0.14	1.30	2.02	14.43	65.00	4.50
21.25	0.1	1.1	1.1	0.0	14.23	0.18	1.27	2.02	14.59	65.00	4.46
20.00	0.1	1.0	1.0	0.0	14.64	0.18	1.25	1.99	15.00	65.00	4.33
15.00	0.1	0.5	0.5	0.0	16.15	0.19	1.16	1.87	16.48	65.00	3.94
10.00	0.0	0.2	0.2	0.0	17.42	0.20	1.08	1.77	17.74	65.00	3.66
5.00	0.0	0.1	0.1	0.0	18.50	0.21	1.01	1.68	18.80	65.00	3.46
0.00	0.0	0.0	0.0	0.0	19.41	0.22	0.94	1.60	19.71	65.00	3.30

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	10.2	10.3	0.1	0.01	0.02	0.00	0.29	0.51	65.00	99.90
60.00	0.7	9.1	9.1	0.1	1.49	0.04	0.00	0.28	1.53	65.00	42.48
55.00	0.6	7.9	8.0	0.1	2.70	0.05	0.00	0.28	2.76	65.00	23.56
50.00	0.5	6.8	6.8	0.1	3.71	0.07	0.00	0.27	3.78	65.00	17.20
48.00	0.5	6.4	6.4	0.0	4.07	0.07	0.00	0.27	4.14	65.00	15.70
48.00	0.5	6.4	6.4	0.0	2.75	0.05	0.00	0.18	2.80	65.00	23.22
45.00	0.5	5.7	5.7	0.0	3.08	0.06	0.00	0.18	3.14	65.00	20.73
45.00	0.5	5.7	5.7	0.0	2.61	0.01	0.00	1.32	3.28	65.00	19.84
40.00	0.4	4.7	4.7	0.0	6.94	0.00	0.00	1.26	7.03	65.00	9.25
35.00	0.3	3.7	3.7	0.0	11.35	0.02	0.00	1.22	11.37	65.00	5.72
32.00	0.3	3.1	3.1	0.0	13.69	0.03	0.00	1.19	13.72	65.00	4.74
32.00	0.3	3.1	3.1	0.0	11.29	0.22	0.00	1.19	11.55	65.00	5.63
30.00	0.2	2.8	2.8	0.0	12.74	0.23	0.00	1.17	12.96	65.00	5.01
30.00	0.2	2.8	2.8	0.0	12.74	0.24	0.00	1.17	12.98	65.00	5.01
25.00	0.2	2.0	2.0	0.0	16.10	0.25	0.00	1.13	16.35	65.00	3.98
21.25	0.1	1.4	1.4	0.0	18.28	0.25	0.00	1.10	18.53	65.00	3.51
21.25	0.1	1.4	1.4	0.0	17.38	0.37	0.00	1.12	17.75	65.00	3.66
20.00	0.1	1.3	1.3	0.0	18.08	0.37	0.00	1.11	18.45	65.00	3.52
15.00	0.1	0.7	0.7	0.0	20.60	0.38	0.00	1.07	20.98	65.00	3.10
10.00	0.0	0.3	0.3	0.0	22.74	0.38	0.00	1.04	23.12	65.00	2.81
5.00	0.0	0.1	0.1	0.0	24.55	0.39	0.00	1.00	24.94	65.00	2.61
0.00	0.0	0.0	0.0	0.0	26.08	0.39	0.00	0.97	26.48	65.00	2.46

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	8.0	8.1	0.1	0.01	0.03	0.00	0.29	0.51	65.00	99.90
60.00	0.7	7.1	7.1	0.0	1.49	0.04	0.00	0.28	1.53	65.00	42.50
55.00	0.6	6.2	6.2	0.0	2.70	0.05	0.00	0.27	2.76	65.00	23.58
50.00	0.5	5.3	5.3	0.0	3.71	0.07	0.00	0.27	3.78	65.00	17.22
48.00	0.5	4.9	5.0	0.0	4.06	0.07	0.00	0.27	4.13	65.00	15.72
48.00	0.5	4.9	5.0	0.0	2.75	0.05	0.00	0.18	2.80	65.00	23.25
45.00	0.4	4.4	4.4	0.0	3.07	0.06	0.00	0.18	3.13	65.00	20.75
45.00	0.4	4.4	4.4	0.0	3.36	0.06	1.91	2.73	5.23	65.00	12.42
40.00	0.4	3.6	3.6	0.0	6.48	0.07	1.75	2.54	7.21	65.00	9.01
35.00	0.3	2.8	2.8	0.0	9.11	0.09	1.60	2.36	9.59	65.00	6.78
32.00	0.3	2.4	2.4	0.0	10.48	0.10	1.52	2.27	10.88	65.00	5.97
32.00	0.3	2.4	2.4	0.0	9.89	0.22	1.55	2.36	10.70	65.00	6.08
30.00	0.2	2.1	2.1	0.0	10.63	0.22	1.50	2.30	11.36	65.00	5.72
30.00	0.2	2.1	2.1	0.0	10.64	0.23	1.50	2.30	11.38	65.00	5.71
25.00	0.2	1.5	1.5	0.0	12.81	0.24	1.38	2.16	13.29	65.00	4.89
21.25	0.1	1.1	1.1	0.0	14.22	0.25	1.30	2.06	14.66	65.00	4.43
21.25	0.1	1.1	1.1	0.0	14.05	0.33	1.28	2.04	14.55	65.00	4.47
20.00	0.1	1.0	1.0	0.0	14.49	0.33	1.25	2.01	14.98	65.00	4.34
15.00	0.1	0.5	0.5	0.0	16.07	0.33	1.16	1.90	16.53	65.00	3.93
10.00	0.0	0.2	0.2	0.0	17.40	0.34	1.08	1.79	17.84	65.00	3.64
5.00	0.0	0.1	0.1	0.0	18.53	0.35	1.01	1.70	18.95	65.00	3.43
0.00	0.0	0.0	0.0	0.0	19.48	0.35	0.95	1.62	19.90	65.00	3.27

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	5.7	5.7	0.0	9.60	0.15	0.79	2.04	9.89	65.00	6.57
37.50	0.5	5.7	5.8	0.1	5.85	0.15	0.79	2.04	6.75	65.00	9.63
35.00	0.5	5.8	5.8	0.1	3.45	0.15	0.79	2.04	5.04	65.00	12.89
33.00	0.5	5.8	5.8	0.1	4.37	0.15	0.79	2.04	5.37	65.00	12.11
33.00	0.5	5.8	5.8	0.1	4.37	0.05	0.79	1.18	4.80	65.00	13.54
30.00	0.5	5.8	5.8	0.1	5.44	0.05	0.79	1.19	5.81	65.00	11.19
27.50	0.5	5.8	5.8	0.1	6.28	0.05	0.79	1.19	6.62	65.00	9.82
25.00	0.5	5.8	5.8	0.0	7.09	0.05	0.79	1.20	7.41	65.00	8.77
22.50	0.5	5.7	5.7	0.0	8.09	0.05	0.79	1.20	8.28	65.00	7.85
20.00	0.5	5.6	5.7	0.0	9.47	0.05	0.79	1.21	9.65	65.00	6.73
20.00	0.5	5.6	5.7	0.0	9.47	0.04	0.79	1.31	9.60	65.00	6.77
17.50	0.5	5.5	5.5	0.0	7.93	0.04	0.79	1.31	8.10	65.00	8.02
15.00	0.5	5.4	5.4	0.0	6.40	0.04	0.79	1.32	6.62	65.00	9.81
12.50	0.5	5.2	5.3	0.0	4.87	0.04	0.79	1.33	5.19	65.00	12.53
10.00	0.5	5.1	5.1	0.0	3.35	0.04	0.79	1.34	3.96	65.00	16.40
7.00	0.4	4.9	4.9	0.0	2.96	0.04	0.79	1.35	3.73	65.00	17.41
7.00	0.4	4.9	4.9	0.0	2.96	0.13	0.79	2.18	4.62	65.00	14.06
5.00	0.4	4.7	4.7	0.0	4.26	0.13	0.79	2.18	5.30	65.00	12.27
2.50	0.4	4.6	4.6	0.0	8.64	0.13	0.79	2.19	8.81	65.00	7.38
0.00	0.4	4.4	4.4	0.0	13.06	0.13	0.79	2.19	13.20	65.00	4.93

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	4.4	4.4	0.0	14.12	0.13	0.79	2.22	14.28	65.00	4.55
37.50	0.5	4.6	4.6	0.1	9.30	0.13	0.79	2.22	9.48	65.00	6.86
35.00	0.5	4.7	4.7	0.1	4.57	0.13	0.79	2.22	5.58	65.00	11.66
33.00	0.5	4.9	4.9	0.1	2.57	0.13	0.79	2.22	4.53	65.00	14.33
33.00	0.5	4.9	4.9	0.1	2.57	0.03	0.79	1.35	3.45	65.00	18.82
30.00	0.5	5.1	5.1	0.1	3.16	0.03	0.79	1.35	3.72	65.00	17.48
27.50	0.5	5.2	5.3	0.1	4.59	0.03	0.79	1.36	4.99	65.00	13.02
25.00	0.5	5.4	5.4	0.0	5.98	0.03	0.79	1.36	6.30	65.00	10.32
22.50	0.5	5.5	5.5	0.0	7.48	0.03	0.79	1.36	7.63	65.00	8.52
20.00	0.5	5.6	5.7	0.0	9.42	0.03	0.79	1.36	9.55	65.00	6.81
20.00	0.5	5.6	5.7	0.0	9.42	0.07	0.79	1.13	9.64	65.00	6.74
17.50	0.5	5.7	5.7	0.0	8.44	0.07	0.79	1.14	8.68	65.00	7.49
15.00	0.5	5.8	5.8	0.0	7.47	0.07	0.79	1.15	7.74	65.00	8.40
12.50	0.5	5.8	5.8	0.0	6.51	0.07	0.79	1.16	6.81	65.00	9.55
10.00	0.5	5.8	5.8	0.0	5.55	0.07	0.79	1.17	5.90	65.00	11.02
7.00	0.5	5.8	5.8	0.0	4.41	0.07	0.79	1.18	4.84	65.00	13.42
7.00	0.5	5.8	5.8	0.0	4.41	0.16	0.79	2.00	5.25	65.00	12.39
5.00	0.5	5.8	5.8	0.0	2.57	0.16	0.79	2.00	4.34	65.00	14.98
2.50	0.5	5.7	5.8	0.0	4.50	0.16	0.79	2.01	5.20	65.00	12.51
0.00	0.5	5.7	5.7	0.0	8.33	0.16	0.79	2.01	8.77	65.00	7.42

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	3.1	3.1	0.0	2.28	0.15	2.03	2.37	4.74	65.00	13.72
37.50	0.3	3.1	3.1	0.1	2.13	0.15	2.03	2.35	4.63	65.00	14.03
35.00	0.3	3.1	3.1	0.1	2.53	0.15	2.03	2.34	4.82	65.00	13.47
33.00	0.3	3.1	3.1	0.1	2.88	0.15	2.03	2.32	4.98	65.00	13.06
33.00	0.3	3.1	3.1	0.1	2.88	0.15	1.15	1.22	3.66	65.00	17.74
30.00	0.3	3.1	3.1	0.1	3.06	0.15	1.15	1.20	3.81	65.00	17.06
27.50	0.3	3.0	3.0	0.1	3.14	0.15	1.15	1.19	3.88	65.00	16.76
25.00	0.3	3.0	3.0	0.2	3.16	0.15	1.15	1.18	3.89	65.00	16.70
22.50	0.3	2.9	3.0	0.1	3.12	0.15	1.15	1.19	3.86	65.00	16.86
20.00	0.3	2.9	2.9	0.1	3.01	0.15	1.15	1.20	3.77	65.00	17.26
20.00	0.3	2.9	2.9	0.1	3.02	0.15	0.27	0.52	3.19	65.00	20.37
17.50	0.3	2.8	2.9	0.1	2.14	0.15	0.27	0.54	2.32	65.00	28.02
15.00	0.3	2.8	2.8	0.1	1.49	0.15	0.27	0.56	1.64	65.00	39.53
12.50	0.3	2.7	2.7	0.1	1.11	0.15	0.27	0.58	1.38	65.00	47.24
10.00	0.3	2.7	2.7	0.0	1.54	0.15	0.27	0.59	1.70	65.00	38.15
7.00	0.3	2.6	2.6	0.0	2.69	0.15	0.27	0.62	2.84	65.00	22.86
7.00	0.3	2.6	2.6	0.0	2.68	0.15	0.61	1.18	3.24	65.00	20.09
5.00	0.3	2.5	2.5	0.0	4.04	0.15	0.61	1.20	4.48	65.00	14.51
2.50	0.3	2.4	2.5	0.0	5.78	0.15	0.61	1.21	6.14	65.00	10.58
0.00	0.3	2.4	2.4	0.0	7.71	0.15	0.61	1.23	7.91	65.00	8.22

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	2.4	2.4	0.0	0.50	0.11	0.61	0.95	1.65	65.00	39.45
37.50	0.3	2.4	2.5	0.0	0.62	0.11	0.61	0.93	1.62	65.00	40.14
35.00	0.3	2.5	2.5	0.1	1.68	0.11	0.61	0.92	2.11	65.00	30.76
33.00	0.3	2.6	2.6	0.1	2.48	0.11	0.61	0.90	2.82	65.00	23.02
33.00	0.3	2.6	2.6	0.1	2.48	0.11	0.27	0.36	2.64	65.00	24.59
30.00	0.3	2.7	2.7	0.1	2.75	0.11	0.27	0.34	2.91	65.00	22.32
27.50	0.3	2.7	2.7	0.1	2.91	0.11	0.27	0.33	3.07	65.00	21.16
25.00	0.3	2.8	2.8	0.2	3.01	0.11	0.27	0.32	3.17	65.00	20.50
22.50	0.3	2.8	2.9	0.1	3.05	0.11	0.27	0.32	3.21	65.00	20.26
20.00	0.3	2.9	2.9	0.1	3.03	0.11	0.27	0.33	3.19	65.00	20.39
20.00	0.3	2.9	2.9	0.1	3.03	0.11	1.15	1.41	3.85	65.00	16.90
17.50	0.3	2.9	3.0	0.1	2.28	0.11	1.15	1.43	3.43	65.00	18.95
15.00	0.3	3.0	3.0	0.1	2.01	0.11	1.15	1.45	3.27	65.00	19.91
12.50	0.3	3.0	3.0	0.1	1.96	0.11	1.15	1.46	3.23	65.00	20.15
10.00	0.3	3.1	3.1	0.0	2.45	0.11	1.15	1.48	3.58	65.00	18.15
7.00	0.3	3.1	3.1	0.0	3.43	0.11	1.15	1.50	4.16	65.00	15.61
7.00	0.3	3.1	3.1	0.0	3.43	0.11	2.04	2.61	5.44	65.00	11.94
5.00	0.3	3.1	3.1	0.0	4.90	0.11	2.04	2.62	6.35	65.00	10.24
2.50	0.3	3.1	3.1	0.0	6.78	0.11	2.04	2.64	7.93	65.00	8.20
0.00	0.3	3.1	3.1	0.0	8.71	0.11	2.04	2.66	9.66	65.00	6.73

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.4	1.4	0.0	0.51	0.06	0.71	0.92	1.66	65.00	39.24
37.50	0.1	1.4	1.4	0.0	0.86	0.06	0.71	0.90	1.71	65.00	38.05
35.00	0.1	1.4	1.4	0.1	1.47	0.06	0.71	0.89	1.92	65.00	33.79
33.00	0.1	1.4	1.4	0.1	1.93	0.06	0.71	0.87	2.31	65.00	28.17
33.00	0.1	1.4	1.4	0.1	1.93	0.06	0.60	0.64	2.25	65.00	28.91
30.00	0.1	1.4	1.4	0.1	2.08	0.06	0.60	0.62	2.38	65.00	27.28
27.50	0.1	1.4	1.4	0.1	2.14	0.06	0.60	0.61	2.43	65.00	26.70
25.00	0.1	1.4	1.4	0.1	2.13	0.06	0.60	0.61	2.43	65.00	26.73
22.50	0.1	1.4	1.4	0.1	2.06	0.06	0.60	0.63	2.38	65.00	27.37
20.00	0.1	1.3	1.4	0.1	1.94	0.06	0.60	0.65	2.26	65.00	28.70
20.00	0.1	1.3	1.4	0.1	1.94	0.06	0.49	0.65	2.21	65.00	29.41
17.50	0.1	1.3	1.3	0.1	1.36	0.06	0.49	0.67	1.79	65.00	36.27
15.00	0.1	1.3	1.3	0.1	1.03	0.06	0.49	0.69	1.59	65.00	40.94
12.50	0.1	1.3	1.3	0.0	0.95	0.06	0.49	0.71	1.57	65.00	41.32
10.00	0.1	1.2	1.2	0.0	1.35	0.06	0.49	0.72	1.76	65.00	36.90
7.00	0.1	1.2	1.2	0.0	2.25	0.06	0.49	0.75	2.54	65.00	25.57
7.00	0.1	1.2	1.2	0.0	2.25	0.06	0.37	0.75	2.50	65.00	25.99
5.00	0.1	1.2	1.2	0.0	3.19	0.06	0.37	0.77	3.39	65.00	19.17
2.50	0.1	1.1	1.1	0.0	4.41	0.06	0.37	0.79	4.58	65.00	14.20
0.00	0.1	1.1	1.1	0.0	5.67	0.06	0.37	0.80	5.82	65.00	11.16

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 4LC2 Ice and Wind

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.1	1.1	0.0	0.29	0.12	0.37	0.59	1.08	65.00	60.27
37.50	0.1	1.1	1.1	0.0	0.87	0.12	0.37	0.57	1.23	65.00	52.79
35.00	0.1	1.2	1.2	0.1	1.50	0.12	0.37	0.55	1.76	65.00	36.95
33.00	0.1	1.2	1.2	0.1	1.96	0.12	0.37	0.54	2.19	65.00	29.74
33.00	0.1	1.2	1.2	0.1	1.96	0.12	0.49	0.53	2.23	65.00	29.18
30.00	0.1	1.2	1.2	0.1	2.10	0.12	0.49	0.52	2.36	65.00	27.50
27.50	0.1	1.3	1.3	0.1	2.16	0.12	0.49	0.51	2.41	65.00	26.92
25.00	0.1	1.3	1.3	0.1	2.16	0.12	0.49	0.51	2.41	65.00	26.99
22.50	0.1	1.3	1.3	0.1	2.09	0.12	0.49	0.52	2.35	65.00	27.71
20.00	0.1	1.4	1.4	0.1	1.96	0.12	0.49	0.54	2.23	65.00	29.21
20.00	0.1	1.4	1.4	0.1	1.96	0.12	0.60	0.77	2.27	65.00	28.61
17.50	0.1	1.4	1.4	0.1	1.39	0.12	0.60	0.79	1.83	65.00	35.53
15.00	0.1	1.4	1.4	0.1	1.09	0.12	0.60	0.80	1.67	65.00	38.87
12.50	0.1	1.4	1.4	0.0	1.04	0.12	0.60	0.82	1.68	65.00	38.72
10.00	0.1	1.4	1.4	0.0	1.42	0.12	0.60	0.84	1.86	65.00	34.95
7.00	0.1	1.4	1.4	0.0	2.35	0.12	0.60	0.86	2.60	65.00	25.00
7.00	0.1	1.4	1.4	0.0	2.35	0.12	0.71	1.09	2.70	65.00	24.03
5.00	0.1	1.4	1.4	0.0	3.31	0.12	0.71	1.11	3.54	65.00	18.34
2.50	0.1	1.4	1.4	0.0	4.55	0.12	0.71	1.12	4.75	65.00	13.68
0.00	0.1	1.4	1.4	0.0	5.84	0.12	0.71	1.14	6.02	65.00	10.80

BY VALMONT INDUSTRIES FOR:
Design Id:Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.27	2.40	0.02	2.40	0.109		0.064	
	7.0000	0.27	2.40	0.02	2.40	0.109		0.064	
	20.0000	0.72	2.40	0.18	2.40	0.104		0.035	
	20.0000	0.72	2.40	0.18	2.40	0.104		0.035	
	33.0000	0.03	2.40	0.10	2.40	0.023		0.024	
	33.0000	0.03	2.40	0.10	2.40	0.023		0.024	
Arm 2	7.0000	0.03	2.40	0.01	2.40	0.117		0.023	
	7.0000	0.03	2.40	0.01	2.40	0.117		0.023	
	20.0000	0.74	2.40	0.19	2.40	0.131		0.032	
	20.0000	0.74	2.40	0.19	2.40	0.131		0.032	
	33.0000	0.27	2.40	0.12	2.40	0.024		0.066	
	33.0000	0.27	2.40	0.12	2.40	0.024		0.066	
Arm 3	7.0000	0.12	2.40	0.03	2.40	0.093		0.006	
	20.0000	0.30	2.40	0.07	2.40	0.097		0.025	
	33.0000	0.02	2.40	0.07	2.40	0.059		0.023	
Arm 4	7.0000	0.02	2.40	0.03	2.40	0.096		0.026	
	20.0000	0.31	2.40	0.08	2.40	0.097		0.022	
	33.0000	0.12	2.40	0.08	2.40	0.031		0.003	
Arm 5	7.0000	0.06	2.40	0.02	2.40	0.074		0.007	
	7.0000	0.06	2.40	0.02	2.40	0.074		0.007	
	20.0000	0.15	2.40	0.07	2.40	0.092		0.022	
	20.0000	0.15	2.40	0.07	2.40	0.092		0.022	
	33.0000	0.01	2.40	0.07	2.40	0.033		0.009	
	33.0000	0.01	2.40	0.07	2.40	0.033		0.009	
Arm 6	7.0000	0.01	2.40	0.02	2.40	0.077		0.010	
	7.0000	0.01	2.40	0.02	2.40	0.077		0.010	
	20.0000	0.15	2.40	0.07	2.40	0.094		0.020	
	20.0000	0.15	2.40	0.07	2.40	0.094		0.020	
	33.0000	0.06	2.40	0.07	2.40	0.028		0.006	
	33.0000	0.06	2.40	0.07	2.40	0.028		0.006	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	148	403	430	534
60.00	24	-18	30	0	370	405	548	840
55.00	49	-48	68	0	604	406	728	1162
50.00	73	-91	117	0	850	407	943	1502
48.00	83	-113	140	0	952	408	1036	1642
48.00	83	-113	140	0	952	408	1036	1643
45.00	97	-150	179	0	1108	410	1182	1965
45.00	161	-283	326	501	-1869	6539	6801	5716
40.00	554	-179	582	501	-1602	6539	6732	6275
35.00	946	-91	951	501	-1322	6539	6671	6860
32.00	1182	-46	1182	501	-1147	6540	6640	7222
32.00	1152	19	1152	494	1353	6615	6752	8390
30.00	1311	-15	1311	494	1472	6616	6778	8636
30.00	1311	-22	1311	494	1941	6613	6892	8838
25.00	1708	-148	1714	494	2245	6610	6981	9476
21.25	2005	-254	2021	494	2483	6612	7063	9967
21.25	2032	-200	2042	470	4374	6617	7932	11113
20.00	2131	-266	2148	471	4453	6612	7972	11284
15.00	2528	-543	2586	471	4780	6605	8153	11974
10.00	2924	-840	3043	471	5118	6596	8349	12690
5.00	3320	-1157	3516	471	5467	6585	8559	13432
0.00	3715	-1496	4005	471	5833	6586	8798	14191

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	405	431	533
60.00	24	-18	30	0	369	407	550	839
55.00	49	-47	68	0	603	410	729	1161
50.00	74	-91	117	0	849	413	944	1501
48.00	84	-113	140	0	951	414	1037	1642
48.00	84	-113	140	0	950	414	1037	1642
45.00	98	-150	179	0	1107	417	1183	1964
45.00	-27	332	333	4	3731	11132	11741	11866
40.00	641	100	649	4	4002	11132	11829	12427
35.00	1309	-148	1318	4	4284	11130	11926	13015
32.00	1710	-306	1737	4	4459	11133	11992	13377
32.00	1425	191	1438	3	4568	10780	11708	17774
30.00	1684	80	1686	3	4687	10782	11757	18020
30.00	1684	73	1686	3	5158	10772	11943	18226
25.00	2331	-246	2343	3	5463	10760	12067	18868
21.25	2815	-497	2858	3	5700	10763	12179	19360
21.25	2699	-55	2699	3	5311	10724	11967	23476
20.00	2859	-135	2863	3	5390	10708	11988	23651
15.00	3502	-469	3533	3	5717	10682	12116	24348
10.00	4143	-822	4224	3	6053	10653	12252	25072
5.00	4782	-1196	4930	3	6399	10620	12399	25822
0.00	5419	-1591	5648	3	6765	10620	12592	26581

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	146	404	430	534
60.00	24	-18	30	0	368	406	548	840
55.00	49	-47	68	0	602	409	728	1162
50.00	73	-91	117	0	848	412	942	1502
48.00	83	-112	140	0	949	413	1035	1643
48.00	83	-112	140	0	949	413	1035	1643
45.00	98	-149	179	0	1106	415	1181	1965
45.00	160	480	506	-495	4482	6528	7919	7746
40.00	552	203	588	-495	4756	6527	8076	8305
35.00	943	-91	948	-495	5040	6527	8246	8890
32.00	1178	-276	1210	-495	5216	6529	8356	9252
32.00	1147	158	1157	-489	4085	6845	7971	12497
30.00	1311	58	1312	-489	4204	6846	8034	12743
30.00	1311	51	1312	-489	4676	6841	8286	12946
25.00	1722	-239	1738	-489	4983	6835	8458	13584
21.25	2029	-468	2082	-489	5221	6837	8602	14075
21.25	2054	-77	2055	-465	5182	6885	8617	17026
20.00	2157	-155	2163	-465	5262	6876	8659	17197
15.00	2570	-481	2614	-465	5591	6862	8851	17887
10.00	2981	-827	3094	-465	5930	6845	9057	18604
5.00	3392	-1193	3596	-465	6280	6827	9276	19346
0.00	3802	-1581	4117	-465	6646	6828	9528	20105

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-314	-187	366	61	-3935	5368	6656	1878
37.50	-153	-71	169	61	-3810	5367	6582	1878
35.00	8	42	43	61	-3686	5366	6510	1876
33.00	136	129	188	61	-3587	5364	6453	1877
33.00	136	129	188	61	-1019	1543	1849	2382
30.00	192	163	252	61	-868	1541	1768	2383
27.50	238	187	303	61	-743	1539	1708	2384
25.00	284	208	352	61	-617	1536	1656	2385
22.50	330	224	399	61	-491	1534	1611	2386
20.00	376	237	445	61	-366	1533	1576	2386
20.00	376	237	445	61	2207	-2289	3179	2878
17.50	308	169	351	61	2332	-2290	3268	2877
15.00	239	97	258	61	2458	-2293	3361	2875
12.50	170	22	171	61	2584	-2295	3456	2874
10.00	101	-58	116	61	2710	-2297	3552	2873
7.00	18	-158	159	61	2860	-2298	3669	2873
7.00	18	-158	159	61	5435	-6117	8182	3358
5.00	-128	-290	317	61	5534	-6116	8248	3362
2.50	-312	-458	554	61	5657	-6115	8331	3370
0.00	-495	-629	801	61	5782	-6116	8417	3370

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-501	-133	518	-64	-3750	6131	7187	2974
37.50	-317	-22	318	-64	-3625	6131	7123	2974
35.00	-133	85	158	-64	-3500	6133	7061	2971
33.00	14	168	168	-64	-3398	6134	7012	2970
33.00	14	168	168	-64	-823	2318	2460	3487
30.00	98	194	218	-64	-672	2317	2413	3488
27.50	167	213	271	-64	-547	2317	2381	3488
25.00	237	227	328	-64	-418	2314	2352	3490
22.50	306	238	388	-64	-292	2312	2330	3491
20.00	376	245	448	-64	-166	2311	2317	3491
20.00	376	245	448	-64	2407	-1509	2841	3997
17.50	330	171	372	-64	2532	-1510	2948	3997
15.00	285	93	300	-64	2658	-1514	3059	3995
12.50	239	11	240	-64	2784	-1517	3170	3994
10.00	194	-74	208	-64	2909	-1520	3282	3993
7.00	139	-182	229	-64	3059	-1523	3417	3993
7.00	139	-182	229	-64	5626	-5346	7761	4489
5.00	11	-318	318	-64	5723	-5347	7833	4492
2.50	-150	-492	514	-64	5844	-5348	7922	4499
0.00	-310	-669	737	-64	5969	-5349	8015	4499

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	97	66	117	141	-1158	-294	1195	-1871
37.50	88	99	133	141	-1033	-295	1074	-1870
35.00	79	128	151	141	-908	-296	955	-1870
33.00	72	149	165	141	-808	-297	861	-1870
33.00	91	149	174	84	-9	-302	302	-1625
30.00	80	146	167	84	141	-302	334	-1625
27.50	71	140	157	84	266	-303	403	-1625
25.00	62	130	144	84	390	-304	494	-1625
22.50	53	117	128	84	515	-304	598	-1625
20.00	44	99	109	84	640	-305	709	-1625
20.00	63	99	118	26	1440	-309	1473	-1381
17.50	53	54	76	26	1565	-310	1596	-1381
15.00	44	6	44	26	1691	-311	1719	-1381
12.50	35	-47	58	26	1816	-311	1842	-1381
10.00	25	-103	106	26	1941	-312	1966	-1381
7.00	14	-176	177	26	2091	-313	2115	-1381
7.00	33	-176	179	-32	2892	-317	2909	-1135
5.00	25	-247	248	-32	2992	-318	3009	-1135
2.50	16	-338	339	-32	3117	-319	3134	-1134
0.00	6	-434	434	-32	3243	-320	3259	-1132

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	7	65	66	29	-1166	77	1169	-2501
37.50	9	98	99	29	-1041	77	1044	-2501
35.00	12	128	128	29	-917	76	920	-2500
33.00	13	149	149	29	-817	76	821	-2500
33.00	32	148	152	-28	-18	72	74	-2255
30.00	35	146	150	-28	131	72	150	-2255
27.50	37	141	145	-28	256	71	266	-2255
25.00	39	131	137	-28	380	71	387	-2255
22.50	41	118	125	-28	505	71	510	-2255
20.00	43	101	110	-28	630	70	634	-2255
20.00	62	100	118	-86	1430	66	1432	-2011
17.50	64	56	85	-86	1555	65	1557	-2011
15.00	66	7	67	-86	1680	65	1682	-2011
12.50	68	-45	82	-86	1806	64	1807	-2011
10.00	70	-101	123	-86	1931	63	1932	-2011
7.00	72	-173	188	-86	2081	62	2082	-2011
7.00	91	-174	196	-143	2882	57	2883	-1765
5.00	93	-244	261	-143	2983	56	2983	-1764
2.50	94	-335	348	-143	3108	55	3108	-1764
0.00	96	-430	441	-143	3234	53	3234	-1762

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	35	50	61	57	-1153	-37	1154	-772
37.50	34	83	90	57	-1028	-38	1029	-771
35.00	33	112	117	57	-903	-38	904	-771
33.00	32	132	136	57	-804	-39	804	-771
33.00	35	129	133	46	-104	-42	112	-528
30.00	34	130	134	46	46	-43	63	-528
27.50	33	126	131	46	171	-44	177	-528
25.00	31	119	123	46	296	-44	299	-528
22.50	30	109	113	46	421	-45	423	-528
20.00	29	94	98	46	546	-45	548	-528
20.00	32	90	96	35	1246	-49	1247	-286
17.50	31	51	60	35	1371	-49	1372	-286
15.00	29	8	30	35	1497	-49	1497	-286
12.50	28	-39	48	35	1622	-50	1623	-286
10.00	26	-89	93	35	1747	-51	1748	-286
7.00	25	-155	157	35	1897	-51	1898	-286
7.00	28	-159	161	25	2597	-54	2598	-42
5.00	27	-222	224	25	2697	-54	2698	-42
2.50	25	-305	306	25	2822	-55	2823	-41
0.00	24	-392	392	25	2948	-55	2948	-40

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	23	54	59	-27	-1144	9	1144	-1893
37.50	24	87	90	-27	-1019	8	1019	-1892
35.00	24	115	118	-27	-894	8	894	-1892
33.00	24	136	138	-27	-794	8	794	-1892
33.00	28	132	135	-37	-95	5	95	-1649
30.00	28	133	136	-37	55	5	55	-1649
27.50	28	129	132	-37	180	5	180	-1649
25.00	28	122	125	-37	304	4	304	-1649
22.50	28	111	114	-37	429	4	429	-1649
20.00	28	96	100	-37	554	3	554	-1649
20.00	32	92	98	-48	1254	0	1254	-1406
17.50	32	53	62	-48	1379	0	1379	-1407
15.00	32	10	34	-48	1504	-1	1504	-1407
12.50	32	-37	49	-48	1630	-2	1630	-1407
10.00	32	-88	94	-48	1755	-2	1755	-1407
7.00	32	-154	157	-48	1905	-3	1905	-1407
7.00	36	-158	162	-59	2606	-7	2606	-1163
5.00	36	-222	224	-59	2706	-7	2706	-1163
2.50	35	-305	307	-59	2831	-8	2831	-1162
0.00	35	-392	393	-59	2957	-9	2957	-1161

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	3.5	3.7	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.8	3.2	3.2	0.0	0.29	0.05	0.00	0.06	0.34	65.00	99.90
55.00	0.7	2.8	2.8	0.0	0.59	0.06	0.00	0.08	0.65	65.00	99.90
50.00	0.6	2.4	2.5	0.0	0.91	0.07	0.00	0.09	0.99	65.00	65.91
48.00	0.5	2.2	2.3	0.0	1.04	0.08	0.00	0.10	1.13	65.00	57.77
48.00	0.5	2.2	2.3	0.0	0.71	0.05	0.00	0.07	0.76	65.00	85.47
45.00	0.5	2.0	2.1	0.0	0.84	0.06	0.00	0.07	0.91	65.00	71.64
45.00	0.5	2.0	2.1	0.0	1.52	0.18	1.18	1.61	3.26	65.00	19.93
40.00	0.4	1.6	1.7	0.0	2.56	0.19	1.08	1.48	3.52	65.00	18.46
35.00	0.3	1.3	1.3	0.0	3.78	0.20	0.99	1.37	4.46	65.00	14.58
32.00	0.3	1.1	1.1	0.0	4.43	0.20	0.94	1.31	5.00	65.00	12.99
32.00	0.3	1.1	1.1	0.0	4.29	0.23	0.93	1.31	4.78	65.00	13.61
30.00	0.3	1.0	1.0	0.0	4.72	0.24	0.90	1.27	5.20	65.00	12.50
30.00	0.3	1.0	1.0	0.0	4.72	0.24	0.90	1.28	5.20	65.00	12.51
25.00	0.2	0.7	0.7	0.0	5.78	0.25	0.83	1.20	6.19	65.00	10.50
21.25	0.2	0.5	0.5	0.0	6.48	0.26	0.78	1.14	6.85	65.00	9.49
21.25	0.2	0.5	0.5	0.0	6.51	0.28	0.74	1.15	6.88	65.00	9.45
20.00	0.1	0.4	0.5	0.0	6.75	0.29	0.73	1.14	7.11	65.00	9.14
15.00	0.1	0.2	0.3	0.0	7.61	0.29	0.68	1.08	7.95	65.00	8.17
10.00	0.0	0.1	0.1	0.0	8.34	0.30	0.63	1.03	8.68	65.00	7.49
5.00	0.0	0.0	0.0	0.0	8.97	0.31	0.59	0.98	9.31	65.00	6.98
0.00	0.0	0.0	0.0	0.0	9.51	0.31	0.55	0.94	9.85	65.00	6.60

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	4.9	5.0	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.7	4.4	4.4	0.0	0.29	0.05	0.00	0.06	0.34	65.00	99.90
55.00	0.6	3.8	3.9	0.0	0.59	0.06	0.00	0.08	0.65	65.00	99.87
50.00	0.6	3.3	3.4	0.0	0.91	0.07	0.00	0.09	0.99	65.00	65.77
48.00	0.5	3.1	3.2	0.0	1.05	0.08	0.00	0.10	1.13	65.00	57.63
48.00	0.5	3.1	3.2	0.0	0.71	0.05	0.00	0.07	0.76	65.00	85.27
45.00	0.5	2.8	2.8	0.0	0.85	0.06	0.00	0.07	0.91	65.00	71.46
45.00	0.5	2.8	2.8	0.0	1.58	0.37	0.01	0.75	2.27	65.00	28.63
40.00	0.4	2.3	2.3	0.0	2.84	0.37	0.01	0.72	3.29	65.00	19.78
35.00	0.3	1.8	1.8	0.0	5.26	0.37	0.01	0.69	5.63	65.00	11.54
32.00	0.3	1.5	1.6	0.0	6.64	0.37	0.01	0.68	7.02	65.00	9.26
32.00	0.3	1.5	1.6	0.0	5.47	0.50	0.01	0.66	6.01	65.00	10.82
30.00	0.3	1.4	1.4	0.0	6.12	0.49	0.01	0.65	6.65	65.00	9.78
30.00	0.3	1.4	1.4	0.0	6.11	0.50	0.01	0.67	6.65	65.00	9.77
25.00	0.2	1.0	1.0	0.0	7.93	0.50	0.01	0.65	8.43	65.00	7.71
21.25	0.2	0.7	0.7	0.0	9.21	0.50	0.00	0.64	9.70	65.00	6.70
21.25	0.2	0.7	0.7	0.0	8.47	0.60	0.01	0.62	9.08	65.00	7.16
20.00	0.1	0.6	0.6	0.0	8.87	0.60	0.01	0.62	9.48	65.00	6.86
15.00	0.1	0.4	0.4	0.0	10.32	0.60	0.00	0.60	10.92	65.00	5.95
10.00	0.0	0.2	0.2	0.0	11.55	0.59	0.00	0.59	12.15	65.00	5.35
5.00	0.0	0.0	0.0	0.0	12.61	0.59	0.00	0.58	13.20	65.00	4.92
0.00	0.0	0.0	0.0	0.0	13.51	0.59	0.00	0.56	14.10	65.00	4.61

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	3.6	3.7	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.7	3.2	3.3	0.0	0.29	0.05	0.00	0.06	0.34	65.00	99.90
55.00	0.6	2.8	2.9	0.0	0.59	0.06	0.00	0.08	0.65	65.00	99.90
50.00	0.5	2.4	2.5	0.0	0.91	0.07	0.00	0.09	0.99	65.00	65.91
48.00	0.5	2.3	2.3	0.0	1.04	0.08	0.00	0.10	1.13	65.00	57.75
48.00	0.5	2.3	2.3	0.0	0.71	0.05	0.00	0.07	0.76	65.00	85.45
45.00	0.5	2.0	2.1	0.0	0.84	0.06	0.00	0.07	0.91	65.00	71.61
45.00	0.5	2.0	2.1	0.0	2.44	0.24	1.17	1.66	3.90	65.00	16.66
40.00	0.4	1.7	1.7	0.0	2.58	0.25	1.06	1.55	3.77	65.00	17.22
35.00	0.3	1.3	1.3	0.0	3.77	0.25	0.98	1.45	4.50	65.00	14.43
32.00	0.3	1.1	1.1	0.0	4.64	0.26	0.93	1.40	5.27	65.00	12.34
32.00	0.3	1.1	1.1	0.0	4.41	0.35	0.92	1.37	5.22	65.00	12.46
30.00	0.3	1.0	1.0	0.0	4.76	0.35	0.89	1.33	5.52	65.00	11.77
30.00	0.3	1.0	1.0	0.0	4.75	0.36	0.89	1.35	5.54	65.00	11.74
25.00	0.2	0.7	0.7	0.0	5.91	0.36	0.82	1.27	6.49	65.00	10.01
21.25	0.2	0.5	0.5	0.0	6.73	0.36	0.77	1.21	7.27	65.00	8.94
21.25	0.2	0.5	0.5	0.0	6.48	0.44	0.74	1.18	7.09	65.00	9.17
20.00	0.1	0.4	0.5	0.0	6.74	0.44	0.72	1.16	7.34	65.00	8.86
15.00	0.1	0.3	0.3	0.0	7.68	0.44	0.67	1.11	8.25	65.00	7.88
10.00	0.0	0.1	0.1	0.0	8.48	0.44	0.62	1.06	9.03	65.00	7.20
5.00	0.0	0.0	0.0	0.0	9.17	0.44	0.58	1.01	9.71	65.00	6.70
0.00	0.0	0.0	0.0	0.0	9.77	0.44	0.55	0.97	10.29	65.00	6.32

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	2.8	2.8	0.0	5.76	0.13	0.47	1.40	5.90	65.00	11.01
37.50	0.5	2.8	2.9	0.1	2.68	0.13	0.47	1.39	2.85	65.00	22.80
35.00	0.5	2.8	2.9	0.1	0.66	0.13	0.47	1.38	2.41	65.00	26.95
33.00	0.5	2.8	2.9	0.1	2.79	0.13	0.47	1.37	3.13	65.00	20.80
33.00	0.5	2.8	2.9	0.1	2.79	0.16	0.47	0.73	3.09	65.00	21.06
30.00	0.5	2.8	2.9	0.2	3.81	0.16	0.47	0.72	4.07	65.00	15.98
27.50	0.5	2.8	2.9	0.2	4.64	0.16	0.47	0.71	4.87	65.00	13.34
25.00	0.5	2.8	2.9	0.2	5.44	0.16	0.47	0.70	5.66	65.00	11.48
22.50	0.5	2.8	2.8	0.2	6.22	0.16	0.47	0.69	6.43	65.00	10.11
20.00	0.5	2.8	2.8	0.2	6.97	0.16	0.47	0.69	7.18	65.00	9.06
20.00	0.5	2.8	2.8	0.2	6.97	0.20	0.47	0.92	7.19	65.00	9.04
17.50	0.5	2.7	2.7	0.2	5.55	0.20	0.47	0.93	5.77	65.00	11.27
15.00	0.5	2.6	2.7	0.1	4.10	0.20	0.47	0.94	4.32	65.00	15.03
12.50	0.5	2.5	2.6	0.1	2.63	0.20	0.47	0.95	2.86	65.00	22.72
10.00	0.5	2.4	2.5	0.1	1.84	0.20	0.47	0.97	2.31	65.00	28.08
7.00	0.5	2.3	2.4	0.0	2.43	0.20	0.47	0.98	2.75	65.00	23.66
7.00	0.5	2.3	2.4	0.0	2.43	0.23	0.47	1.61	3.47	65.00	18.72
5.00	0.5	2.2	2.3	0.0	5.04	0.23	0.47	1.62	5.27	65.00	12.34
2.50	0.5	2.1	2.2	0.0	8.62	0.23	0.47	1.63	8.85	65.00	7.34
0.00	0.5	2.0	2.1	0.0	12.26	0.23	0.47	1.65	12.49	65.00	5.20

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	2.0	2.1	0.0	8.17	0.20	0.49	1.49	8.44	65.00	7.70
37.50	0.5	2.1	2.1	0.1	4.79	0.20	0.49	1.48	5.22	65.00	12.45
35.00	0.5	2.2	2.2	0.1	2.47	0.20	0.49	1.47	3.51	65.00	18.54
33.00	0.5	2.3	2.3	0.1	2.55	0.20	0.49	1.46	3.61	65.00	18.01
33.00	0.5	2.3	2.3	0.1	2.55	0.24	0.49	0.83	3.07	65.00	21.17
30.00	0.5	2.4	2.5	0.2	3.45	0.24	0.49	0.82	3.91	65.00	16.60
27.50	0.5	2.5	2.6	0.2	4.15	0.24	0.49	0.82	4.58	65.00	14.20
25.00	0.5	2.6	2.6	0.2	4.87	0.24	0.49	0.82	5.20	65.00	12.51
22.50	0.5	2.7	2.7	0.2	5.95	0.24	0.49	0.81	6.27	65.00	10.37
20.00	0.5	2.7	2.8	0.2	7.01	0.24	0.49	0.81	7.32	65.00	8.88
20.00	0.5	2.7	2.8	0.2	7.01	0.27	0.49	0.89	7.39	65.00	8.80
17.50	0.5	2.8	2.8	0.2	5.90	0.27	0.49	0.90	6.30	65.00	10.32
15.00	0.5	2.8	2.9	0.1	4.75	0.27	0.49	0.91	5.19	65.00	12.52
12.50	0.5	2.8	2.9	0.1	3.59	0.27	0.49	0.93	4.09	65.00	15.91
10.00	0.5	2.8	2.9	0.1	3.30	0.27	0.49	0.94	3.93	65.00	16.54
7.00	0.5	2.8	2.9	0.0	3.52	0.27	0.49	0.96	4.06	65.00	15.99
7.00	0.5	2.8	2.9	0.0	3.52	0.31	0.49	1.57	4.60	65.00	14.13
5.00	0.5	2.8	2.9	0.0	4.74	0.31	0.49	1.58	5.66	65.00	11.48
2.50	0.5	2.8	2.9	0.0	8.14	0.31	0.49	1.59	8.57	65.00	7.58
0.00	0.5	2.8	2.8	0.0	11.72	0.31	0.49	1.61	12.12	65.00	5.36

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.5	1.6	0.0	1.83	0.13	1.08	1.25	2.75	65.00	23.64
37.50	0.3	1.5	1.6	0.0	1.99	0.13	1.08	1.23	2.78	65.00	23.39
35.00	0.3	1.5	1.6	0.1	2.37	0.13	1.08	1.21	3.03	65.00	21.43
33.00	0.3	1.5	1.5	0.1	2.63	0.13	1.08	1.20	3.25	65.00	19.97
33.00	0.3	1.5	1.5	0.1	2.74	0.11	0.64	0.68	3.04	65.00	21.41
30.00	0.3	1.5	1.5	0.1	2.64	0.11	0.64	0.69	2.95	65.00	22.07
27.50	0.3	1.5	1.5	0.1	2.49	0.11	0.64	0.70	2.82	65.00	23.09
25.00	0.3	1.5	1.5	0.1	2.29	0.11	0.64	0.71	2.64	65.00	24.66
22.50	0.3	1.4	1.5	0.1	2.04	0.11	0.64	0.72	2.41	65.00	26.97
20.00	0.3	1.4	1.4	0.1	1.73	0.11	0.64	0.74	2.14	65.00	30.32
20.00	0.3	1.4	1.4	0.1	1.84	0.09	0.20	0.40	1.98	65.00	32.83
17.50	0.3	1.4	1.4	0.1	1.12	0.09	0.20	0.42	1.38	65.00	47.09
15.00	0.3	1.3	1.4	0.0	0.68	0.09	0.20	0.44	1.06	65.00	61.46
12.50	0.3	1.3	1.3	0.0	0.90	0.09	0.20	0.46	1.19	65.00	54.81
10.00	0.3	1.3	1.3	0.0	1.67	0.09	0.20	0.47	1.87	65.00	34.84
7.00	0.3	1.2	1.3	0.0	2.67	0.09	0.20	0.49	2.83	65.00	22.94
7.00	0.3	1.2	1.3	0.0	2.79	0.08	0.24	0.65	2.87	65.00	22.67
5.00	0.3	1.2	1.2	0.0	3.78	0.08	0.24	0.66	3.86	65.00	16.85
2.50	0.3	1.1	1.2	0.0	5.07	0.08	0.24	0.68	5.15	65.00	12.63
0.00	0.3	1.1	1.1	0.0	6.41	0.08	0.24	0.70	6.49	65.00	10.01

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	1.1	1.1	0.0	1.00	0.17	0.22	0.39	1.21	65.00	53.74
37.50	0.3	1.1	1.2	0.0	1.50	0.17	0.22	0.37	1.70	65.00	38.20
35.00	0.3	1.2	1.2	0.1	1.95	0.17	0.22	0.35	2.14	65.00	30.33
33.00	0.3	1.2	1.2	0.1	2.27	0.17	0.22	0.34	2.46	65.00	26.44
33.00	0.3	1.2	1.2	0.1	2.38	0.15	0.22	0.23	2.56	65.00	25.42
30.00	0.3	1.3	1.3	0.1	2.36	0.15	0.22	0.24	2.54	65.00	25.58
27.50	0.3	1.3	1.3	0.1	2.29	0.15	0.22	0.25	2.47	65.00	26.34
25.00	0.3	1.3	1.4	0.1	2.16	0.15	0.22	0.27	2.34	65.00	27.78
22.50	0.3	1.4	1.4	0.1	1.98	0.15	0.22	0.29	2.16	65.00	30.12
20.00	0.3	1.4	1.4	0.1	1.74	0.15	0.22	0.30	1.92	65.00	33.83
20.00	0.3	1.4	1.4	0.1	1.86	0.14	0.66	0.86	2.23	65.00	29.19
17.50	0.3	1.4	1.5	0.1	1.28	0.14	0.66	0.88	1.88	65.00	34.53
15.00	0.3	1.5	1.5	0.0	1.02	0.14	0.66	0.89	1.76	65.00	36.84
12.50	0.3	1.5	1.5	0.0	1.28	0.14	0.66	0.91	1.91	65.00	33.98
10.00	0.3	1.5	1.5	0.0	1.91	0.14	0.66	0.93	2.27	65.00	28.62
7.00	0.3	1.5	1.5	0.0	2.99	0.14	0.66	0.95	3.27	65.00	19.87
7.00	0.3	1.5	1.5	0.0	3.11	0.12	1.10	1.50	3.68	65.00	17.64
5.00	0.3	1.5	1.6	0.0	4.15	0.12	1.10	1.52	4.58	65.00	14.21
2.50	0.3	1.5	1.6	0.0	5.50	0.12	1.10	1.53	5.85	65.00	11.10
0.00	0.3	1.5	1.6	0.0	6.91	0.12	1.10	1.55	7.21	65.00	9.01

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.7	0.7	0.0	0.95	0.05	0.44	0.60	1.28	65.00	50.96
37.50	0.2	0.7	0.7	0.0	1.42	0.05	0.44	0.58	1.62	65.00	40.12
35.00	0.2	0.7	0.7	0.1	1.84	0.05	0.44	0.56	2.01	65.00	32.34
33.00	0.2	0.7	0.7	0.1	2.14	0.05	0.44	0.55	2.29	65.00	28.34
33.00	0.2	0.7	0.7	0.1	2.11	0.04	0.35	0.37	2.22	65.00	29.24
30.00	0.2	0.7	0.7	0.1	2.11	0.04	0.35	0.36	2.23	65.00	29.11
27.50	0.2	0.7	0.7	0.1	2.06	0.04	0.35	0.38	2.18	65.00	29.79
25.00	0.2	0.7	0.7	0.1	1.95	0.04	0.35	0.40	2.08	65.00	31.26
22.50	0.2	0.7	0.7	0.1	1.78	0.04	0.35	0.41	1.93	65.00	33.76
20.00	0.2	0.7	0.7	0.1	1.56	0.04	0.35	0.43	1.72	65.00	37.74
20.00	0.2	0.7	0.7	0.1	1.52	0.02	0.27	0.45	1.65	65.00	39.46
17.50	0.2	0.6	0.7	0.1	0.94	0.02	0.27	0.46	1.12	65.00	57.89
15.00	0.2	0.6	0.6	0.0	0.48	0.02	0.27	0.48	0.95	65.00	68.42
12.50	0.2	0.6	0.6	0.0	0.74	0.02	0.27	0.50	1.07	65.00	60.86
10.00	0.2	0.6	0.6	0.0	1.47	0.02	0.27	0.52	1.62	65.00	40.02
7.00	0.2	0.6	0.6	0.0	2.43	0.02	0.27	0.54	2.53	65.00	25.68
7.00	0.2	0.6	0.6	0.0	2.50	0.00	0.19	0.55	2.57	65.00	25.27
5.00	0.2	0.6	0.6	0.0	3.43	0.00	0.19	0.56	3.48	65.00	18.66
2.50	0.2	0.5	0.6	0.0	4.64	0.00	0.19	0.58	4.68	65.00	13.89
0.00	0.2	0.5	0.5	0.0	5.90	0.00	0.19	0.60	5.93	65.00	10.95

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.5	0.5	0.0	0.94	0.13	0.20	0.36	1.16	65.00	55.95
37.50	0.2	0.5	0.5	0.0	1.42	0.13	0.20	0.35	1.61	65.00	40.39
35.00	0.2	0.5	0.6	0.1	1.84	0.13	0.20	0.33	2.02	65.00	32.22
33.00	0.2	0.6	0.6	0.1	2.14	0.13	0.20	0.31	2.31	65.00	28.16
33.00	0.2	0.6	0.6	0.1	2.11	0.11	0.29	0.30	2.28	65.00	28.56
30.00	0.2	0.6	0.6	0.1	2.12	0.11	0.29	0.29	2.28	65.00	28.45
27.50	0.2	0.6	0.6	0.1	2.07	0.11	0.29	0.31	2.23	65.00	29.12
25.00	0.2	0.6	0.6	0.1	1.96	0.11	0.29	0.33	2.13	65.00	30.57
22.50	0.2	0.6	0.7	0.1	1.80	0.11	0.29	0.35	1.97	65.00	33.04
20.00	0.2	0.6	0.7	0.1	1.59	0.11	0.29	0.36	1.75	65.00	37.05
20.00	0.2	0.6	0.7	0.1	1.55	0.10	0.37	0.54	1.73	65.00	37.58
17.50	0.2	0.7	0.7	0.1	0.97	0.10	0.37	0.56	1.18	65.00	54.88
15.00	0.2	0.7	0.7	0.0	0.53	0.10	0.37	0.58	1.08	65.00	60.40
12.50	0.2	0.7	0.7	0.0	0.75	0.10	0.37	0.60	1.17	65.00	55.49
10.00	0.2	0.7	0.7	0.0	1.49	0.10	0.37	0.61	1.66	65.00	39.20
7.00	0.2	0.7	0.7	0.0	2.46	0.10	0.37	0.64	2.60	65.00	25.03
7.00	0.2	0.7	0.7	0.0	2.54	0.08	0.45	0.82	2.67	65.00	24.32
5.00	0.2	0.7	0.7	0.0	3.47	0.08	0.45	0.83	3.59	65.00	18.09
2.50	0.2	0.7	0.7	0.0	4.69	0.08	0.45	0.85	4.80	65.00	13.54
0.00	0.2	0.7	0.7	0.0	5.97	0.08	0.45	0.87	6.07	65.00	10.71

BY VALMONT INDUSTRIES FOR:
Design Id:Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.35	2.40	0.06	2.40	0.073		0.077	
	7.0000	0.35	2.40	0.06	2.40	0.073		0.077	
	20.0000	0.95	2.40	0.18	2.40	0.084		0.042	
	20.0000	0.95	2.40	0.18	2.40	0.084		0.042	
	33.0000	0.03	2.40	0.07	2.40	0.053		0.018	
	33.0000	0.03	2.40	0.07	2.40	0.053		0.018	
Arm 2	7.0000	0.03	2.40	0.04	2.40	0.082		0.018	
	7.0000	0.03	2.40	0.04	2.40	0.082		0.018	
	20.0000	0.95	2.40	0.19	2.40	0.095		0.042	
	20.0000	0.95	2.40	0.19	2.40	0.095		0.042	
	33.0000	0.35	2.40	0.09	2.40	0.044		0.077	
	33.0000	0.35	2.40	0.09	2.40	0.044		0.077	
Arm 3	7.0000	0.18	2.40	0.01	2.40	0.043		0.005	
	20.0000	0.47	2.40	0.08	2.40	0.039		0.037	
	33.0000	0.01	2.40	0.04	2.40	0.059		0.020	
Arm 4	7.0000	0.01	2.40	0.01	2.40	0.072		0.020	
	20.0000	0.47	2.40	0.08	2.40	0.039		0.037	
	33.0000	0.18	2.40	0.04	2.40	0.011		0.005	
Arm 5	7.0000	0.11	2.40	0.01	2.40	0.039		0.002	
	7.0000	0.11	2.40	0.01	2.40	0.039		0.002	
	20.0000	0.26	2.40	0.07	2.40	0.052		0.035	
	20.0000	0.26	2.40	0.07	2.40	0.052		0.035	
	33.0000	0.00	2.40	0.03	2.40	0.031		0.001	
	33.0000	0.00	2.40	0.03	2.40	0.031		0.001	
Arm 6	7.0000	0.00	2.40	0.01	2.40	0.047		0.001	
	7.0000	0.00	2.40	0.01	2.40	0.047		0.001	
	20.0000	0.26	2.40	0.07	2.40	0.053		0.035	
	20.0000	0.26	2.40	0.07	2.40	0.053		0.035	
	33.0000	0.11	2.40	0.04	2.40	0.017		0.002	
	33.0000	0.11	2.40	0.04	2.40	0.017		0.002	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	102	452	463	532
60.00	37	-6	37	0	103	677	684	838
55.00	84	-12	85	0	104	914	919	1160
50.00	147	-19	148	0	105	1162	1167	1500
48.00	176	-21	177	0	105	1266	1270	1640
48.00	176	-21	177	0	105	1265	1270	1641
45.00	224	-25	226	0	106	1425	1429	1963
45.00	305	-327	447	587	-2268	8712	9002	6386
40.00	836	-191	857	587	-2272	8982	9265	6947
35.00	1383	-54	1384	587	-2275	9264	9540	7535
32.00	1720	27	1720	587	-2274	9442	9712	7896
32.00	1708	-82	1710	660	-417	10832	10840	9790
30.00	1970	-72	1971	660	-417	10953	10961	10036
30.00	1977	-72	1978	660	-419	11417	11425	10240
25.00	2671	-47	2671	660	-422	11717	11725	10884
21.25	3204	-28	3204	660	-422	11958	11965	11376
21.25	3240	-137	3243	712	652	13137	13153	13179
20.00	3438	-147	3441	712	649	13207	13223	13358
15.00	4240	-185	4244	712	644	13520	13536	14061
10.00	5062	-224	5067	712	640	13842	13857	14791
5.00	5903	-262	5909	712	635	14173	14187	15548
0.00	6765	-300	6771	712	635	14540	14553	16308

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	100	454	465	530
60.00	37	-6	37	0	100	679	687	836
55.00	85	-12	86	0	100	917	923	1159
50.00	147	-18	148	0	100	1167	1171	1499
48.00	176	-20	178	0	101	1271	1275	1639
48.00	176	-20	178	0	101	1270	1274	1639
45.00	225	-24	226	0	101	1431	1434	1961
45.00	64	122	138	0	1599	13846	13938	11795
40.00	903	26	903	0	1599	14116	14206	12360
35.00	1759	-70	1760	0	1599	14396	14484	12952
32.00	2280	-127	2284	0	1599	14575	14662	13314
32.00	1958	18	1958	-1	1433	16437	16499	17693
30.00	2354	-16	2354	-1	1433	16559	16621	17939
30.00	2361	-16	2361	-1	1433	17015	17075	18149
25.00	3392	-102	3393	-1	1433	17304	17363	18803
21.25	4176	-167	4179	-1	1433	17546	17604	19295
21.25	4015	-51	4015	-1	1193	19893	19929	23401
20.00	4314	-69	4315	-1	1193	19950	19985	23589
15.00	5521	-141	5523	-1	1192	20239	20274	24311
10.00	6746	-212	6749	-1	1190	20533	20567	25062
5.00	7988	-284	7993	-1	1189	20832	20866	25843
0.00	9249	-355	9256	-1	1189	21199	21232	26602

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	99	453	463	532
60.00	37	-6	37	0	98	677	684	838
55.00	84	-12	85	0	97	914	919	1160
50.00	147	-18	148	0	96	1163	1167	1500
48.00	176	-20	177	0	96	1266	1270	1641
48.00	176	-20	177	0	96	1266	1270	1641
45.00	224	-23	226	0	96	1425	1429	1963
45.00	305	429	527	-588	3978	8716	9581	7001
40.00	836	191	858	-588	3983	8985	9828	7563
35.00	1384	-49	1385	-588	3985	9266	10087	8151
32.00	1721	-192	1731	-588	3985	9445	10251	8512
32.00	1709	64	1710	-661	2296	10833	11074	11013
30.00	1970	8	1970	-661	2296	10955	11193	11260
30.00	1977	8	1977	-661	2298	11417	11646	11464
25.00	2672	-130	2675	-661	2301	11716	11940	12108
21.25	3204	-233	3213	-661	2301	11956	12176	12600
21.25	3241	-7	3241	-712	1468	13134	13216	14887
20.00	3438	-30	3438	-712	1470	13203	13284	15065
15.00	4241	-118	4242	-712	1474	13513	13593	15768
10.00	5062	-207	5066	-712	1477	13832	13910	16499
5.00	5902	-296	5910	-712	1479	14159	14236	17256
0.00	6763	-384	6774	-712	1479	14526	14601	18015

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-324	-352	479	81	-4609	6208	7732	2395
37.50	-140	-216	257	81	-4485	6083	7558	2395
35.00	41	-83	92	81	-4365	5957	7385	2391
33.00	182	21	183	81	-4266	5857	7246	2391
33.00	182	21	183	81	-1716	2023	2653	2896
30.00	252	80	265	81	-1568	1872	2441	2897
27.50	307	125	331	81	-1444	1745	2265	2899
25.00	357	166	394	81	-1320	1618	2088	2900
22.50	404	204	453	81	-1196	1491	1911	2902
20.00	447	238	506	81	-1072	1366	1736	2902
20.00	447	238	506	81	1484	-2468	2880	3391
17.50	371	192	417	81	1608	-2593	3051	3391
15.00	291	142	324	81	1733	-2719	3225	3389
12.50	208	88	225	81	1858	-2845	3398	3387
10.00	120	30	124	81	1983	-2971	3572	3386
7.00	11	-44	45	81	2132	-3121	3780	3385
7.00	11	-44	45	81	4692	-6951	8386	3865
5.00	-157	-158	223	81	4791	-7049	8523	3868
2.50	-371	-303	479	81	4914	-7170	8692	3875
0.00	-588	-453	742	81	5038	-7295	8865	3875

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-587	-302	660	-81	-4421	7290	8526	2367
37.50	-370	-171	408	-81	-4297	7165	8355	2367
35.00	-157	-44	163	-81	-4173	7043	8186	2362
33.00	11	55	56	-81	-4073	6944	8051	2360
33.00	11	55	56	-81	-1514	3119	3467	2880
30.00	120	107	161	-81	-1364	2969	3268	2881
27.50	208	146	254	-81	-1239	2844	3102	2883
25.00	291	181	343	-81	-1114	2718	2937	2884
22.50	371	212	427	-81	-989	2591	2773	2886
20.00	447	240	507	-81	-865	2466	2614	2886
20.00	447	240	507	-81	1691	-1365	2173	3396
17.50	404	188	445	-81	1815	-1490	2348	3396
15.00	357	131	381	-81	1939	-1618	2525	3394
12.50	307	71	315	-81	2063	-1745	2702	3392
10.00	252	8	252	-81	2186	-1874	2879	3390
7.00	182	-74	197	-81	2334	-2024	3090	3390
7.00	182	-74	197	-81	4885	-5858	7628	3886
5.00	40	-192	196	-81	4982	-5959	7767	3887
2.50	-140	-344	371	-81	5102	-6084	7940	3892
0.00	-325	-498	595	-81	5225	-6209	8116	3892

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	37	-109	115	161	-1882	934	2101	-1692
37.50	64	-54	84	161	-1758	809	1935	-1692
35.00	86	-4	86	161	-1634	684	1772	-1692
33.00	101	35	107	161	-1536	584	1643	-1692
33.00	101	35	107	103	-737	471	875	-1691
30.00	115	58	129	103	-588	321	670	-1691
27.50	123	74	144	103	-465	197	505	-1691
25.00	127	86	154	103	-341	72	349	-1691
22.50	128	95	159	103	-218	-52	224	-1691
20.00	124	99	159	103	-94	-176	200	-1691
20.00	124	100	159	46	705	-288	761	-1691
17.50	114	77	137	46	829	-412	925	-1692
15.00	99	50	111	46	952	-536	1093	-1692
12.50	81	19	84	46	1076	-660	1263	-1692
10.00	60	-15	62	46	1201	-784	1434	-1692
7.00	29	-61	67	46	1349	-934	1641	-1692
7.00	29	-61	67	-12	2149	-1045	2389	-1693
5.00	3	-113	113	-12	2248	-1144	2522	-1693
2.50	-34	-183	186	-12	2372	-1269	2690	-1692
0.00	-74	-256	266	-12	2497	-1394	2859	-1691

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-73	-110	132	12	-1889	1393	2347	-1859
37.50	-34	-55	64	12	-1765	1268	2173	-1860
35.00	3	-4	5	12	-1641	1144	2000	-1860
33.00	29	34	45	12	-1542	1044	1862	-1860
33.00	29	34	45	-46	-743	933	1192	-1859
30.00	60	58	84	-46	-594	784	984	-1859
27.50	82	74	110	-46	-470	660	810	-1858
25.00	99	86	132	-46	-346	536	638	-1858
22.50	114	95	148	-46	-223	411	468	-1858
20.00	124	100	159	-46	-99	287	303	-1858
20.00	124	100	159	-103	700	175	722	-1858
17.50	128	77	149	-103	824	51	825	-1858
15.00	127	50	137	-103	948	-74	950	-1858
12.50	123	20	125	-103	1071	-198	1089	-1858
10.00	115	-14	116	-103	1195	-322	1238	-1859
7.00	101	-60	117	-103	1344	-472	1424	-1859
7.00	101	-60	117	-161	2143	-585	2221	-1859
5.00	86	-112	141	-161	2242	-685	2344	-1859
2.50	63	-181	192	-161	2366	-811	2501	-1858
0.00	37	-254	257	-161	2489	-935	2659	-1858

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-49	-112	123	80	-1804	1181	2156	-836
37.50	-16	-60	62	80	-1680	1057	1985	-836
35.00	14	-12	18	80	-1556	932	1814	-836
33.00	35	25	43	80	-1457	832	1678	-836
33.00	35	25	43	66	-758	705	1035	-836
30.00	58	49	76	66	-609	556	825	-836
27.50	73	66	98	66	-485	431	649	-835
25.00	84	78	115	66	-361	307	474	-835
22.50	91	87	126	66	-237	183	299	-835
20.00	95	93	132	66	-113	59	127	-835
20.00	95	93	132	51	586	-68	590	-835
17.50	91	73	117	51	710	-192	736	-836
15.00	83	50	97	51	834	-316	892	-836
12.50	72	23	76	51	958	-440	1055	-836
10.00	57	-8	57	51	1083	-564	1221	-836
7.00	34	-49	60	51	1232	-713	1423	-836
7.00	34	-49	60	37	1931	-839	2106	-836
5.00	13	-97	98	37	2031	-938	2237	-836
2.50	-18	-159	160	37	2155	-1062	2403	-836
0.00	-51	-226	232	37	2280	-1187	2570	-836

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-51	-109	121	-37	-1796	1186	2152	-1076
37.50	-17	-57	60	-37	-1671	1062	1980	-1077
35.00	13	-9	16	-37	-1547	938	1809	-1077
33.00	34	27	43	-37	-1448	839	1673	-1077
33.00	34	27	43	-51	-748	713	1034	-1076
30.00	57	51	76	-51	-599	564	823	-1076
27.50	72	67	98	-51	-475	440	648	-1076
25.00	83	79	115	-51	-351	316	472	-1076
22.50	91	88	127	-51	-227	192	297	-1075
20.00	95	93	133	-51	-103	67	123	-1075
20.00	95	93	133	-66	596	-59	599	-1076
17.50	91	73	117	-66	720	-183	743	-1076
15.00	84	50	98	-66	844	-308	899	-1076
12.50	73	23	76	-66	968	-432	1060	-1076
10.00	58	-8	58	-66	1092	-556	1226	-1076
7.00	35	-50	61	-66	1241	-706	1428	-1076
7.00	35	-50	61	-80	1940	-833	2111	-1076
5.00	14	-98	99	-80	2039	-933	2243	-1076
2.50	-16	-161	162	-80	2163	-1057	2408	-1076
0.00	-49	-228	233	-80	2288	-1182	2575	-1075

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.3	5.9	5.9	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.2	5.3	5.3	0.0	0.36	0.05	0.00	0.07	0.40	65.00	99.90
55.00	0.2	4.6	4.7	0.0	0.73	0.06	0.00	0.09	0.79	65.00	81.83
50.00	0.2	4.0	4.0	0.0	1.15	0.07	0.00	0.12	1.22	65.00	53.13
48.00	0.2	3.8	3.8	0.0	1.32	0.08	0.00	0.12	1.40	65.00	46.34
48.00	0.2	3.8	3.8	0.0	0.90	0.05	0.00	0.08	0.95	65.00	68.54
45.00	0.1	3.4	3.4	0.0	1.08	0.06	0.00	0.09	1.14	65.00	57.12
45.00	0.1	3.4	3.4	0.0	2.16	0.20	1.38	1.95	4.02	65.00	16.18
40.00	0.1	2.8	2.8	0.0	3.77	0.21	1.26	1.82	4.79	65.00	13.58
35.00	0.1	2.2	2.2	0.0	5.45	0.22	1.16	1.71	6.18	65.00	10.52
32.00	0.1	1.9	1.9	0.0	6.40	0.22	1.10	1.65	6.98	65.00	9.31
32.00	0.1	1.9	1.9	0.0	6.41	0.27	1.24	1.85	7.12	65.00	9.12
30.00	0.1	1.7	1.7	0.0	7.13	0.28	1.20	1.81	7.78	65.00	8.35
30.00	0.1	1.7	1.7	0.0	7.16	0.28	1.20	1.83	7.82	65.00	8.32
25.00	0.1	1.2	1.2	0.0	8.88	0.29	1.11	1.73	9.44	65.00	6.89
21.25	0.0	0.9	0.9	0.0	10.03	0.29	1.04	1.66	10.54	65.00	6.17
21.25	0.0	0.9	0.9	0.0	10.23	0.34	1.12	1.81	10.80	65.00	6.02
20.00	0.0	0.8	0.8	0.0	10.65	0.34	1.10	1.78	11.20	65.00	5.80
15.00	0.0	0.4	0.4	0.0	12.20	0.34	1.03	1.69	12.71	65.00	5.11
10.00	0.0	0.2	0.2	0.0	13.56	0.35	0.95	1.62	14.04	65.00	4.63
5.00	0.0	0.1	0.1	0.0	14.76	0.35	0.89	1.54	15.22	65.00	4.27
0.00	0.0	0.0	0.0	0.0	15.82	0.36	0.83	1.48	16.27	65.00	4.00

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	7.7	7.7	0.1	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.2	6.9	6.9	0.0	0.36	0.05	0.00	0.07	0.40	65.00	99.90
55.00	0.2	6.1	6.1	0.0	0.74	0.06	0.00	0.10	0.80	65.00	81.62
50.00	0.2	5.3	5.3	0.0	1.15	0.07	0.00	0.12	1.23	65.00	52.99
48.00	0.1	4.9	4.9	0.0	1.33	0.08	0.00	0.12	1.41	65.00	46.21
48.00	0.1	4.9	4.9	0.0	0.90	0.05	0.00	0.08	0.95	65.00	68.36
45.00	0.1	4.5	4.5	0.0	1.08	0.06	0.00	0.09	1.14	65.00	56.96
45.00	0.1	4.5	4.5	0.0	0.65	0.37	0.00	0.88	1.82	65.00	35.70
40.00	0.1	3.7	3.7	0.0	3.87	0.37	0.00	0.85	4.28	65.00	15.20
35.00	0.1	2.9	2.9	0.0	6.93	0.37	0.00	0.83	7.30	65.00	8.90
32.00	0.1	2.5	2.5	0.0	8.58	0.37	0.00	0.82	8.95	65.00	7.26
32.00	0.1	2.5	2.5	0.0	7.28	0.49	0.00	0.93	7.79	65.00	8.34
30.00	0.1	2.2	2.2	0.0	8.46	0.49	0.00	0.92	8.96	65.00	7.26
30.00	0.1	2.2	2.2	0.0	8.48	0.50	0.00	0.95	8.99	65.00	7.23
25.00	0.1	1.6	1.6	0.0	11.32	0.50	0.00	0.92	11.82	65.00	5.50
21.25	0.0	1.2	1.2	0.0	13.18	0.49	0.00	0.91	13.68	65.00	4.75
21.25	0.0	1.2	1.2	0.0	12.58	0.60	0.00	1.03	13.19	65.00	4.93
20.00	0.0	1.0	1.0	0.0	13.28	0.60	0.00	1.02	13.88	65.00	4.68
15.00	0.0	0.6	0.6	0.0	15.81	0.59	0.00	1.00	16.41	65.00	3.96
10.00	0.0	0.3	0.3	0.0	18.01	0.59	0.00	0.98	18.61	65.00	3.49
5.00	0.0	0.1	0.1	0.0	19.93	0.59	0.00	0.96	20.52	65.00	3.17
0.00	0.0	0.0	0.0	0.0	21.60	0.59	0.00	0.95	22.19	65.00	2.93

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	5.9	5.9	0.0	0.03	0.03	0.00	0.05	0.10	65.00	99.90
60.00	0.2	5.3	5.3	0.0	0.36	0.05	0.00	0.07	0.40	65.00	99.90
55.00	0.1	4.6	4.7	0.0	0.73	0.06	0.00	0.10	0.79	65.00	81.89
50.00	0.1	4.0	4.0	0.0	1.15	0.07	0.00	0.12	1.22	65.00	53.18
48.00	0.1	3.8	3.8	0.0	1.32	0.08	0.00	0.12	1.40	65.00	46.38
48.00	0.1	3.8	3.8	0.0	0.89	0.05	0.00	0.08	0.95	65.00	68.61
45.00	0.1	3.4	3.4	0.0	1.07	0.06	0.00	0.09	1.14	65.00	57.18
45.00	0.1	3.4	3.4	0.0	2.51	0.22	1.38	1.99	4.35	65.00	14.94
40.00	0.1	2.8	2.8	0.0	3.78	0.23	1.26	1.85	4.90	65.00	13.26
35.00	0.1	2.2	2.2	0.0	5.45	0.23	1.16	1.74	6.17	65.00	10.54
32.00	0.1	1.9	1.9	0.0	6.57	0.24	1.10	1.68	7.11	65.00	9.15
32.00	0.1	1.9	1.9	0.0	6.40	0.31	1.24	1.86	7.20	65.00	9.02
30.00	0.1	1.7	1.7	0.0	7.07	0.31	1.20	1.82	7.82	65.00	8.32
30.00	0.1	1.7	1.7	0.0	7.10	0.31	1.20	1.84	7.85	65.00	8.28
25.00	0.1	1.2	1.2	0.0	8.96	0.32	1.11	1.74	9.46	65.00	6.87
21.25	0.0	0.9	0.9	0.0	10.20	0.32	1.05	1.67	10.67	65.00	6.09
21.25	0.0	0.9	0.9	0.0	10.13	0.38	1.13	1.81	10.76	65.00	6.04
20.00	0.0	0.8	0.8	0.0	10.56	0.38	1.11	1.78	11.14	65.00	5.83
15.00	0.0	0.4	0.4	0.0	12.15	0.39	1.03	1.69	12.64	65.00	5.14
10.00	0.0	0.2	0.2	0.0	13.55	0.39	0.96	1.62	14.02	65.00	4.64
5.00	0.0	0.1	0.1	0.0	14.78	0.39	0.89	1.54	15.24	65.00	4.27
0.00	0.0	0.0	0.0	0.0	15.87	0.40	0.83	1.48	16.32	65.00	3.98

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	4.5	4.5	0.0	7.15	0.16	0.62	1.69	7.59	65.00	8.56
37.50	0.1	4.5	4.5	0.0	4.02	0.16	0.62	1.67	4.64	65.00	13.99
35.00	0.1	4.5	4.5	0.1	1.47	0.16	0.62	1.65	3.24	65.00	20.06
33.00	0.1	4.5	4.5	0.1	2.81	0.16	0.62	1.63	3.73	65.00	17.41
33.00	0.1	4.5	4.5	0.1	2.81	0.20	0.62	0.99	3.26	65.00	19.95
30.00	0.1	4.5	4.5	0.1	4.20	0.20	0.62	0.96	4.57	65.00	14.23
27.50	0.1	4.5	4.5	0.2	5.27	0.20	0.62	0.93	5.60	65.00	11.60
25.00	0.1	4.4	4.4	0.2	6.26	0.20	0.62	0.91	6.57	65.00	9.89
22.50	0.1	4.4	4.4	0.2	7.18	0.20	0.62	0.88	7.47	65.00	8.70
20.00	0.1	4.3	4.3	0.2	8.02	0.20	0.62	0.86	8.30	65.00	7.83
20.00	0.1	4.3	4.3	0.2	8.02	0.23	0.62	1.02	8.30	65.00	7.83
17.50	0.1	4.3	4.3	0.2	6.62	0.23	0.62	1.04	6.91	65.00	9.40
15.00	0.1	4.1	4.2	0.2	5.14	0.23	0.62	1.07	5.45	65.00	11.92
12.50	0.1	4.0	4.0	0.1	3.59	0.23	0.62	1.09	3.92	65.00	16.56
10.00	0.1	3.9	3.9	0.1	1.95	0.23	0.62	1.12	2.36	65.00	27.53
7.00	0.1	3.7	3.7	0.1	0.71	0.23	0.62	1.14	2.02	65.00	32.12
7.00	0.1	3.7	3.7	0.1	0.71	0.26	0.62	1.79	3.12	65.00	20.85
5.00	0.1	3.6	3.6	0.1	3.28	0.26	0.62	1.81	3.84	65.00	16.95
2.50	0.1	3.5	3.5	0.0	7.30	0.26	0.62	1.83	7.71	65.00	8.43
0.00	0.1	3.4	3.4	0.0	11.39	0.26	0.62	1.85	11.76	65.00	5.53

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	3.4	3.4	0.0	10.47	0.16	0.62	1.81	10.72	65.00	6.06
37.50	0.1	3.5	3.5	0.0	6.48	0.16	0.62	1.78	6.78	65.00	9.58
35.00	0.1	3.6	3.6	0.1	2.58	0.16	0.62	1.76	3.44	65.00	18.87
33.00	0.1	3.7	3.7	0.1	0.87	0.16	0.62	1.74	3.13	65.00	20.79
33.00	0.1	3.7	3.7	0.1	0.87	0.20	0.62	1.10	2.12	65.00	30.63
30.00	0.1	3.9	3.9	0.1	2.42	0.20	0.62	1.07	2.97	65.00	21.90
27.50	0.1	4.0	4.0	0.2	3.94	0.20	0.62	1.05	4.27	65.00	15.23
25.00	0.1	4.1	4.2	0.2	5.38	0.20	0.62	1.03	5.68	65.00	11.45
22.50	0.1	4.3	4.3	0.2	6.74	0.20	0.62	1.00	7.02	65.00	9.25
20.00	0.1	4.3	4.3	0.2	8.03	0.20	0.62	0.98	8.30	65.00	7.83
20.00	0.1	4.3	4.3	0.2	8.03	0.23	0.62	0.92	8.36	65.00	7.77
17.50	0.1	4.4	4.4	0.2	7.08	0.23	0.62	0.94	7.43	65.00	8.75
15.00	0.1	4.4	4.4	0.2	6.05	0.23	0.62	0.97	6.42	65.00	10.12
12.50	0.1	4.5	4.5	0.1	4.94	0.23	0.62	0.99	5.35	65.00	12.15
10.00	0.1	4.5	4.5	0.1	3.76	0.23	0.62	1.02	4.26	65.00	15.25
7.00	0.1	4.5	4.5	0.1	3.13	0.23	0.62	1.05	3.80	65.00	17.11
7.00	0.1	4.5	4.5	0.1	3.13	0.26	0.62	1.68	4.34	65.00	14.99
5.00	0.1	4.5	4.5	0.1	3.07	0.26	0.62	1.70	4.39	65.00	14.79
2.50	0.1	4.5	4.5	0.0	5.90	0.26	0.62	1.72	6.47	65.00	10.04
0.00	0.1	4.5	4.5	0.0	9.30	0.26	0.62	1.75	9.77	65.00	6.65

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	2.5	2.5	0.0	1.83	0.12	1.23	1.52	3.05	65.00	21.35
37.50	0.1	2.5	2.5	0.0	1.26	0.12	1.23	1.50	2.84	65.00	22.86
35.00	0.1	2.5	2.5	0.0	1.28	0.12	1.23	1.48	2.82	65.00	23.08
33.00	0.1	2.5	2.5	0.1	1.70	0.12	1.23	1.46	2.89	65.00	22.46
33.00	0.1	2.5	2.5	0.1	1.70	0.12	0.79	0.91	2.20	65.00	29.53
30.00	0.1	2.5	2.5	0.1	2.05	0.12	0.79	0.88	2.51	65.00	25.88
27.50	0.1	2.4	2.4	0.1	2.26	0.12	0.79	0.86	2.70	65.00	24.05
25.00	0.1	2.4	2.4	0.1	2.40	0.11	0.79	0.84	2.83	65.00	22.99
22.50	0.1	2.4	2.4	0.1	2.45	0.11	0.79	0.82	2.88	65.00	22.54
20.00	0.1	2.3	2.3	0.1	2.43	0.11	0.79	0.82	2.87	65.00	22.63
20.00	0.1	2.3	2.3	0.1	2.43	0.12	0.35	0.46	2.65	65.00	24.54
17.50	0.1	2.3	2.3	0.1	2.14	0.12	0.35	0.48	2.37	65.00	27.39
15.00	0.1	2.2	2.2	0.1	1.76	0.12	0.35	0.50	2.03	65.00	32.02
12.50	0.1	2.2	2.2	0.1	1.31	0.12	0.35	0.53	1.63	65.00	39.85
10.00	0.1	2.1	2.1	0.0	0.97	0.12	0.35	0.55	1.44	65.00	45.20
7.00	0.1	2.0	2.0	0.0	1.07	0.12	0.35	0.58	1.51	65.00	43.05
7.00	0.1	2.0	2.0	0.0	1.07	0.12	0.09	0.42	1.21	65.00	53.64
5.00	0.1	2.0	2.0	0.0	1.68	0.12	0.09	0.44	1.82	65.00	35.68
2.50	0.1	1.9	1.9	0.0	2.89	0.12	0.09	0.47	3.01	65.00	21.62
0.00	0.1	1.9	1.9	0.0	4.21	0.12	0.09	0.49	4.32	65.00	15.04

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.9	1.9	0.0	2.06	0.13	0.09	0.42	2.19	65.00	29.72
37.50	0.1	1.9	1.9	0.0	1.01	0.13	0.09	0.39	1.14	65.00	57.06
35.00	0.1	2.0	2.0	0.0	0.07	0.13	0.09	0.37	0.64	65.00	99.90
33.00	0.1	2.0	2.0	0.1	0.68	0.13	0.09	0.35	0.84	65.00	76.97
33.00	0.1	2.0	2.0	0.1	0.68	0.13	0.35	0.52	1.02	65.00	63.49
30.00	0.1	2.1	2.1	0.1	1.23	0.13	0.35	0.49	1.52	65.00	42.89
27.50	0.1	2.2	2.2	0.1	1.65	0.13	0.35	0.46	1.89	65.00	34.36
25.00	0.1	2.2	2.2	0.1	1.99	0.13	0.35	0.44	2.21	65.00	29.44
22.50	0.1	2.3	2.3	0.1	2.25	0.13	0.35	0.41	2.45	65.00	26.48
20.00	0.1	2.3	2.3	0.1	2.43	0.13	0.35	0.39	2.63	65.00	24.73
20.00	0.1	2.3	2.3	0.1	2.43	0.13	0.79	0.89	2.82	65.00	23.01
17.50	0.1	2.4	2.4	0.1	2.34	0.13	0.79	0.91	2.74	65.00	23.75
15.00	0.1	2.4	2.4	0.1	2.18	0.13	0.79	0.92	2.58	65.00	25.15
12.50	0.1	2.4	2.4	0.1	1.93	0.13	0.79	0.94	2.41	65.00	27.01
10.00	0.1	2.5	2.5	0.0	1.78	0.13	0.79	0.96	2.35	65.00	27.68
7.00	0.1	2.5	2.5	0.0	1.85	0.13	0.79	0.99	2.43	65.00	26.75
7.00	0.1	2.5	2.5	0.0	1.85	0.13	1.23	1.54	3.17	65.00	20.48
5.00	0.1	2.5	2.5	0.0	2.17	0.13	1.23	1.56	3.27	65.00	19.88
2.50	0.1	2.5	2.5	0.0	3.05	0.13	1.23	1.58	3.87	65.00	16.79
0.00	0.1	2.5	2.5	0.0	3.96	0.13	1.23	1.60	4.62	65.00	14.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	1.2	1.2	0.0	1.95	0.06	0.62	0.92	2.23	65.00	29.15
37.50	0.0	1.2	1.2	0.0	0.98	0.06	0.62	0.89	1.63	65.00	39.88
35.00	0.0	1.2	1.2	0.0	0.28	0.06	0.62	0.87	1.52	65.00	42.77
33.00	0.0	1.2	1.2	0.0	0.67	0.06	0.62	0.85	1.50	65.00	43.29
33.00	0.0	1.2	1.2	0.0	0.67	0.06	0.50	0.65	1.15	65.00	56.39
30.00	0.0	1.2	1.2	0.1	1.15	0.06	0.50	0.62	1.47	65.00	44.13
27.50	0.0	1.2	1.2	0.1	1.47	0.06	0.50	0.59	1.73	65.00	37.53
25.00	0.0	1.2	1.2	0.1	1.71	0.06	0.50	0.57	1.95	65.00	33.38
22.50	0.0	1.1	1.1	0.1	1.87	0.06	0.50	0.55	2.10	65.00	30.92
20.00	0.0	1.1	1.1	0.1	1.96	0.06	0.50	0.52	2.19	65.00	29.72
20.00	0.0	1.1	1.1	0.1	1.96	0.06	0.39	0.47	2.17	65.00	29.98
17.50	0.0	1.1	1.1	0.1	1.78	0.06	0.39	0.49	2.01	65.00	32.30
15.00	0.0	1.1	1.1	0.1	1.53	0.06	0.39	0.52	1.79	65.00	36.28
12.50	0.0	1.1	1.1	0.0	1.20	0.06	0.39	0.54	1.52	65.00	42.87
10.00	0.0	1.0	1.0	0.0	0.88	0.06	0.39	0.56	1.35	65.00	48.11
7.00	0.0	1.0	1.0	0.0	0.93	0.06	0.39	0.59	1.37	65.00	47.36
7.00	0.0	1.0	1.0	0.0	0.93	0.06	0.28	0.57	1.33	65.00	48.92
5.00	0.0	0.9	0.9	0.0	1.50	0.06	0.28	0.59	1.79	65.00	36.37
2.50	0.0	0.9	0.9	0.0	2.45	0.06	0.28	0.61	2.56	65.00	25.37
0.00	0.0	0.9	0.9	0.0	3.63	0.06	0.28	0.64	3.73	65.00	17.43

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC1 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	0.9	0.9	0.0	1.92	0.07	0.28	0.58	2.08	65.00	31.28
37.50	0.0	0.9	0.9	0.0	0.95	0.07	0.28	0.56	1.19	65.00	54.41
35.00	0.0	0.9	0.9	0.0	0.24	0.07	0.28	0.53	0.97	65.00	66.90
33.00	0.0	1.0	1.0	0.0	0.66	0.07	0.28	0.51	1.04	65.00	62.75
33.00	0.0	1.0	1.0	0.0	0.66	0.07	0.39	0.54	1.07	65.00	60.66
30.00	0.0	1.0	1.0	0.1	1.15	0.07	0.39	0.51	1.44	65.00	45.21
27.50	0.0	1.1	1.1	0.1	1.47	0.07	0.39	0.48	1.71	65.00	38.01
25.00	0.0	1.1	1.1	0.1	1.71	0.07	0.39	0.46	1.92	65.00	33.77
22.50	0.0	1.1	1.1	0.1	1.87	0.07	0.39	0.43	2.07	65.00	31.37
20.00	0.0	1.1	1.1	0.1	1.96	0.07	0.39	0.41	2.15	65.00	30.24
20.00	0.0	1.1	1.1	0.1	1.96	0.07	0.50	0.59	2.18	65.00	29.77
17.50	0.0	1.1	1.1	0.1	1.79	0.07	0.50	0.61	2.00	65.00	32.54
15.00	0.0	1.2	1.2	0.1	1.54	0.07	0.50	0.63	1.79	65.00	36.31
12.50	0.0	1.2	1.2	0.0	1.21	0.07	0.50	0.65	1.54	65.00	42.08
10.00	0.0	1.2	1.2	0.0	0.90	0.07	0.50	0.67	1.43	65.00	45.41
7.00	0.0	1.2	1.2	0.0	0.95	0.07	0.50	0.70	1.46	65.00	44.66
7.00	0.0	1.2	1.2	0.0	0.95	0.07	0.62	0.91	1.75	65.00	37.09
5.00	0.0	1.2	1.2	0.0	1.53	0.07	0.62	0.93	2.06	65.00	31.53
2.50	0.0	1.2	1.2	0.0	2.46	0.07	0.62	0.95	2.74	65.00	23.74
0.00	0.0	1.2	1.2	0.0	3.65	0.07	0.62	0.97	3.86	65.00	16.85

BY VALMONT INDUSTRIES FOR:
Design Id:Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.13	2.40	0.04	2.40	0.060		0.031	
	7.0000	0.13	2.40	0.04	2.40	0.060		0.031	
	20.0000	0.35	2.40	0.01	2.40	0.097		0.019	
	20.0000	0.35	2.40	0.01	2.40	0.097		0.019	
	33.0000	0.02	2.40	0.05	2.40	0.046		0.013	
	33.0000	0.02	2.40	0.05	2.40	0.046		0.013	
Arm 2	7.0000	0.01	2.40	0.04	2.40	0.058		0.012	
	7.0000	0.01	2.40	0.04	2.40	0.058		0.012	
	20.0000	0.36	2.40	0.03	2.40	0.098		0.016	
	20.0000	0.36	2.40	0.03	2.40	0.098		0.016	
	33.0000	0.13	2.40	0.06	2.40	0.048		0.032	
	33.0000	0.13	2.40	0.06	2.40	0.048		0.032	
Arm 3	7.0000	0.06	2.40	0.02	2.40	0.091		0.004	
	20.0000	0.14	2.40	0.07	2.40	0.093		0.013	
	33.0000	0.01	2.40	0.07	2.40	0.048		0.010	
Arm 4	7.0000	0.01	2.40	0.02	2.40	0.089		0.013	
	20.0000	0.15	2.40	0.08	2.40	0.096		0.010	
	33.0000	0.06	2.40	0.08	2.40	0.035		0.001	
Arm 5	7.0000	0.03	2.40	0.02	2.40	0.071		0.004	
	7.0000	0.03	2.40	0.02	2.40	0.071		0.004	
	20.0000	0.07	2.40	0.07	2.40	0.082		0.011	
	20.0000	0.07	2.40	0.07	2.40	0.082		0.011	
	33.0000	0.00	2.40	0.07	2.40	0.026		0.004	
	33.0000	0.00	2.40	0.07	2.40	0.026		0.004	
Arm 6	7.0000	0.00	2.40	0.02	2.40	0.073		0.005	
	7.0000	0.00	2.40	0.02	2.40	0.073		0.005	
	20.0000	0.08	2.40	0.07	2.40	0.085		0.010	
	20.0000	0.08	2.40	0.07	2.40	0.085		0.010	
	33.0000	0.03	2.40	0.07	2.40	0.024		0.003	
	33.0000	0.03	2.40	0.07	2.40	0.024		0.003	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	300	334	135
60.00	18	-18	26	0	369	301	476	441
55.00	36	-47	60	0	603	302	674	764
50.00	54	-91	106	0	849	303	901	1104
48.00	62	-113	128	0	951	303	998	1244
48.00	62	-113	128	0	950	303	998	1244
45.00	72	-150	166	0	1107	304	1148	1566
45.00	104	46	113	247	353	3342	3360	1142
40.00	304	17	305	247	624	3343	3401	1700
35.00	505	-29	506	247	905	3344	3464	2284
32.00	625	-65	628	247	1080	3345	3515	2645
32.00	566	-8	566	242	1131	3316	3504	3852
30.00	646	-36	647	242	1250	3317	3545	4098
30.00	646	-43	647	242	1720	3316	3736	4298
25.00	845	-156	859	242	2026	3316	3886	4932
21.25	994	-252	1026	242	2263	3317	4016	5423
21.25	999	-207	1020	231	4051	3308	5230	6606
20.00	1049	-268	1082	231	4131	3307	5292	6775
15.00	1247	-526	1353	231	4460	3305	5551	7460
10.00	1445	-804	1654	231	4800	3303	5827	8172
5.00	1644	-1102	1979	231	5151	3300	6118	8909
0.00	1842	-1422	2327	231	5517	3300	6429	9668

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	147	301	335	135
60.00	18	-18	26	0	369	302	476	441
55.00	36	-47	60	0	602	303	674	764
50.00	54	-91	106	0	848	305	901	1103
48.00	62	-112	128	0	950	305	998	1244
48.00	62	-112	128	0	950	305	998	1244
45.00	73	-150	166	0	1106	307	1148	1566
45.00	13	308	308	5	3439	5660	6622	2640
40.00	352	93	365	5	3709	5661	6768	3198
35.00	692	-138	706	5	3992	5662	6928	3782
32.00	896	-284	940	5	4167	5664	7031	4144
32.00	670	186	696	4	4300	5507	6986	8571
30.00	802	82	807	4	4419	5507	7061	8817
30.00	802	74	806	4	4389	5505	7363	9019
25.00	1133	-228	1156	4	5195	5504	7568	9654
21.25	1381	-467	1457	4	5433	5505	7734	10146
21.25	1308	-46	1309	4	5087	5490	7484	14268
20.00	1390	-123	1396	4	5167	5485	7536	14437
15.00	1719	-443	1775	4	5495	5478	7759	15125
10.00	2048	-783	2193	4	5834	5469	7997	15838
5.00	2376	-1144	2637	4	6183	5459	8248	16578
0.00	2704	-1526	3105	4	6549	5459	8526	17337

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	-3	3	0	146	301	334	135
60.00	18	-18	26	0	368	302	476	441
55.00	36	-47	60	0	602	303	674	764
50.00	54	-91	106	0	848	305	901	1104
48.00	62	-112	128	0	950	305	998	1244
48.00	62	-112	128	0	950	305	998	1244
45.00	73	-149	166	0	1106	306	1148	1566
45.00	102	127	162	-241	1929	3325	3844	3076
40.00	301	3	301	-241	2200	3326	3988	3634
35.00	501	-138	520	-241	2483	3326	4151	4217
32.00	621	-230	662	-241	2658	3328	4259	4578
32.00	560	185	589	-237	3953	3539	5306	7748
30.00	645	89	651	-237	4072	3540	5396	7994
30.00	645	82	650	-237	4543	3538	5758	8195
25.00	857	-200	880	-237	4849	3537	6002	8829
21.25	1016	-424	1101	-237	5087	3538	6196	9320
21.25	1019	-44	1020	-225	5109	3573	6234	12220
20.00	1073	-122	1080	-225	5189	3570	6298	12388
15.00	1287	-443	1361	-225	5518	3565	6569	13074
10.00	1501	-784	1693	-225	5857	3559	6854	13786
5.00	1714	-1146	2062	-225	6207	3552	7152	14523
0.00	1927	-1530	2461	-225	6574	3552	7472	15283

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-162	189	249	29	430	2687	2721	-375
37.50	-81	174	192	29	555	2686	2743	-375
35.00	-1	156	156	29	680	2686	2770	-375
33.00	64	138	152	29	779	2685	2796	-376
33.00	64	138	152	29	471	787	917	25
30.00	92	119	150	29	622	786	1002	25
27.50	116	98	152	29	747	786	1084	25
25.00	139	74	158	29	872	785	1173	25
22.50	163	46	169	29	997	785	1269	25
20.00	186	14	187	29	1122	784	1369	25
20.00	186	14	187	29	815	-1115	1381	423
17.50	153	-12	153	29	940	-1116	1459	423
15.00	119	-42	127	29	1065	-1116	1543	423
12.50	86	-76	115	29	1191	-1117	1632	423
10.00	52	-114	125	29	1316	-1117	1726	423
7.00	12	-164	164	29	1466	-1118	1844	423
7.00	12	-164	164	29	1159	-3018	3233	820
5.00	-60	-193	202	29	1259	-3018	3270	820
2.50	-151	-233	277	29	1384	-3018	3321	822
0.00	-241	-276	367	29	1509	-3019	3375	822

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-247	195	315	-31	424	3038	3068	752
37.50	-156	181	239	-31	549	3038	3087	753
35.00	-65	162	175	-31	675	3038	3112	752
33.00	8	145	145	-31	775	3038	3135	751
33.00	8	145	145	-31	469	1140	1232	1154
30.00	49	125	135	-31	619	1139	1297	1154
27.50	83	105	134	-31	745	1139	1361	1154
25.00	117	81	143	-31	870	1138	1433	1154
22.50	152	53	161	-31	996	1138	1512	1155
20.00	186	21	187	-31	1121	1137	1597	1154
20.00	186	21	187	-31	814	-762	1115	1556
17.50	163	-5	163	-31	939	-763	1210	1556
15.00	140	-35	144	-31	1064	-764	1310	1556
12.50	117	-69	136	-31	1189	-764	1413	1556
10.00	94	-107	142	-31	1314	-765	1520	1556
7.00	67	-157	170	-31	1464	-766	1652	1556
7.00	67	-157	170	-31	1156	-2665	2905	1956
5.00	3	-186	186	-31	1256	-2665	2946	1956
2.50	-77	-225	238	-31	1379	-2666	3001	1957
0.00	-157	-268	311	-31	1504	-2666	3061	1957

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	46	50	68	112	-1232	-198	1247	555
37.50	40	85	94	112	-1106	-199	1124	556
35.00	34	117	122	112	-981	-200	1001	556
33.00	29	139	142	112	-881	-200	904	556
33.00	48	139	147	54	-81	-202	218	801
30.00	41	139	145	54	69	-203	214	802
27.50	35	135	140	54	194	-203	281	802
25.00	29	128	131	54	319	-204	379	801
22.50	23	116	118	54	445	-204	489	801
20.00	17	101	102	54	570	-204	606	801
20.00	35	101	107	-3	1370	-206	1386	1046
17.50	29	58	65	-3	1495	-207	1510	1046
15.00	23	11	26	-3	1621	-207	1634	1045
12.50	17	-39	43	-3	1746	-207	1758	1045
10.00	11	-94	94	-3	1871	-208	1882	1046
7.00	3	-164	164	-3	2021	-208	2032	1045
7.00	22	-164	165	-61	2821	-210	2829	1291
5.00	17	-233	233	-61	2920	-211	2928	1292
2.50	11	-322	322	-61	3045	-212	3052	1294
0.00	4	-415	415	-61	3170	-212	3177	1294

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	5	57	58	59	-1206	-28	1206	-51
37.50	4	92	92	59	-1081	-29	1081	-51
35.00	3	122	122	59	-956	-29	956	-50
33.00	2	144	144	59	-856	-29	856	-50
33.00	21	144	145	1	-56	-31	64	195
30.00	20	143	145	1	94	-31	99	195
27.50	19	139	140	1	219	-31	221	195
25.00	18	130	131	1	344	-31	346	195
22.50	17	118	119	1	469	-32	470	195
20.00	16	102	103	1	595	-32	595	195
20.00	35	102	108	-56	1395	-34	1395	439
17.50	34	58	67	-56	1520	-34	1520	439
15.00	33	11	35	-56	1645	-34	1646	439
12.50	32	-41	52	-56	1770	-35	1771	439
10.00	31	-96	101	-56	1895	-36	1896	439
7.00	30	-167	169	-56	2046	-36	2046	439
7.00	49	-167	174	-114	2845	-39	2846	685
5.00	48	-236	241	-114	2945	-40	2946	686
2.50	46	-326	330	-114	3070	-41	3070	687
0.00	45	-420	423	-114	3195	-41	3195	687

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	17	39	42	35	-1202	-29	1203	-710
37.50	16	73	75	35	-1077	-29	1078	-710
35.00	15	103	105	35	-953	-29	953	-710
33.00	14	125	126	35	-853	-30	853	-710
33.00	18	121	123	25	-153	-31	156	-467
30.00	17	124	125	25	-3	-32	32	-466
27.50	16	122	123	25	122	-32	126	-466
25.00	15	117	118	25	247	-32	249	-466
22.50	14	108	108	25	372	-33	374	-467
20.00	13	94	95	25	497	-33	498	-467
20.00	17	91	92	14	1197	-34	1198	-224
17.50	16	53	55	14	1322	-35	1323	-224
15.00	15	11	19	14	1448	-35	1448	-225
12.50	14	-34	37	14	1573	-35	1573	-225
10.00	13	-83	84	14	1698	-35	1698	-225
7.00	11	-147	147	14	1848	-36	1848	-224
7.00	15	-151	151	3	2548	-37	2549	19
5.00	14	-213	213	3	2648	-37	2649	19
2.50	13	-294	295	3	2773	-38	2774	20
0.00	12	-379	380	3	2898	-38	2899	21

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	11	45	47	-5	-1182	-8	1182	-1788
37.50	11	79	80	-5	-1057	-8	1057	-1788
35.00	11	109	109	-5	-933	-8	933	-1788
33.00	11	130	130	-5	-833	-8	833	-1787
33.00	14	126	127	-16	-133	-9	134	-1544
30.00	14	128	129	-16	16	-10	19	-1544
27.50	14	126	127	-16	141	-10	141	-1544
25.00	13	120	121	-16	266	-10	266	-1544
22.50	13	110	111	-16	391	-10	391	-1544
20.00	13	96	97	-16	516	-10	516	-1544
20.00	17	93	94	-27	1216	-12	1216	-1302
17.50	16	54	57	-27	1341	-12	1341	-1302
15.00	16	12	20	-27	1466	-12	1466	-1302
12.50	15	-34	37	-27	1591	-13	1591	-1302
10.00	15	-83	85	-27	1716	-13	1716	-1302
7.00	15	-148	149	-27	1867	-13	1867	-1302
7.00	18	-152	153	-37	2567	-15	2567	-1059
5.00	18	-214	215	-37	2667	-15	2667	-1059
2.50	18	-296	297	-37	2793	-16	2793	-1058
0.00	17	-382	382	-37	2918	-16	2918	-1056

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	1.8	1.9	0.0	0.03	0.01	0.00	0.04	0.08	65.00	99.90
60.00	0.7	1.6	1.7	0.0	0.25	0.02	0.00	0.05	0.27	65.00	99.90
55.00	0.6	1.4	1.5	0.0	0.51	0.04	0.00	0.07	0.55	65.00	99.90
50.00	0.5	1.2	1.3	0.0	0.81	0.05	0.00	0.09	0.86	65.00	75.36
48.00	0.5	1.1	1.2	0.0	0.94	0.06	0.00	0.10	1.00	65.00	64.92
48.00	0.5	1.1	1.2	0.0	0.64	0.04	0.00	0.06	0.68	65.00	96.04
45.00	0.5	1.0	1.1	0.0	0.79	0.05	0.00	0.07	0.84	65.00	77.68
45.00	0.5	1.0	1.1	0.0	0.54	0.04	0.58	0.79	1.40	65.00	46.28
40.00	0.4	0.8	0.9	0.0	1.31	0.05	0.53	0.74	1.66	65.00	39.24
35.00	0.3	0.6	0.7	0.0	2.00	0.07	0.49	0.69	2.23	65.00	29.16
32.00	0.3	0.5	0.6	0.0	2.38	0.07	0.46	0.66	2.58	65.00	25.21
32.00	0.3	0.5	0.6	0.0	2.11	0.11	0.45	0.65	2.34	65.00	27.75
30.00	0.3	0.5	0.5	0.0	2.35	0.11	0.44	0.64	2.57	65.00	25.30
30.00	0.3	0.5	0.5	0.0	2.36	0.12	0.44	0.65	2.57	65.00	25.31
25.00	0.2	0.3	0.4	0.0	2.93	0.13	0.41	0.61	3.12	65.00	20.81
21.25	0.2	0.2	0.3	0.0	3.32	0.14	0.38	0.59	3.50	65.00	18.59
21.25	0.2	0.2	0.3	0.0	3.29	0.17	0.37	0.63	3.48	65.00	18.68
20.00	0.1	0.2	0.3	0.0	3.43	0.17	0.36	0.63	3.62	65.00	17.95
15.00	0.1	0.1	0.1	0.0	3.95	0.18	0.33	0.61	4.14	65.00	15.70
10.00	0.0	0.1	0.1	0.0	4.40	0.19	0.31	0.59	4.60	65.00	14.14
5.00	0.0	0.0	0.0	0.0	4.97	0.20	0.29	0.57	5.19	65.00	12.53
0.00	0.0	0.0	0.0	0.0	5.52	0.21	0.27	0.56	5.75	65.00	11.31

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.7	2.4	2.5	0.0	0.03	0.01	0.00	0.04	0.08	65.00	99.90
60.00	0.7	2.2	2.3	0.0	0.25	0.02	0.00	0.05	0.27	65.00	99.90
55.00	0.6	1.9	2.0	0.0	0.51	0.04	0.00	0.07	0.55	65.00	99.90
50.00	0.5	1.6	1.7	0.0	0.81	0.05	0.00	0.09	0.86	65.00	75.29
48.00	0.5	1.5	1.6	0.0	0.94	0.06	0.00	0.10	1.00	65.00	64.93
48.00	0.5	1.5	1.6	0.0	0.64	0.04	0.00	0.06	0.68	65.00	96.05
45.00	0.5	1.4	1.5	0.0	0.79	0.05	0.00	0.07	0.84	65.00	77.68
45.00	0.5	1.4	1.5	0.0	1.45	0.08	0.01	0.43	1.68	65.00	38.77
40.00	0.4	1.1	1.2	0.0	1.61	0.10	0.01	0.42	1.78	65.00	36.59
35.00	0.3	0.9	0.9	0.0	2.84	0.11	0.01	0.41	2.96	65.00	21.97
32.00	0.3	0.8	0.8	0.0	3.60	0.12	0.01	0.40	3.73	65.00	17.44
32.00	0.3	0.8	0.8	0.0	2.67	0.24	0.01	0.40	2.96	65.00	21.98
30.00	0.3	0.7	0.7	0.0	2.96	0.24	0.01	0.40	3.24	65.00	20.04
30.00	0.3	0.7	0.7	0.0	2.95	0.25	0.01	0.41	3.25	65.00	20.01
25.00	0.2	0.5	0.5	0.0	3.95	0.25	0.01	0.41	4.22	65.00	15.41
21.25	0.2	0.4	0.4	0.0	4.70	0.26	0.01	0.41	4.97	65.00	13.07
21.25	0.2	0.4	0.4	0.0	4.12	0.37	0.01	0.39	4.50	65.00	14.45
20.00	0.1	0.3	0.3	0.0	4.36	0.37	0.01	0.39	4.74	65.00	13.72
15.00	0.1	0.2	0.2	0.0	5.23	0.37	0.01	0.39	5.61	65.00	11.59
10.00	0.0	0.1	0.1	0.0	5.98	0.37	0.01	0.39	6.36	65.00	10.22
5.00	0.0	0.0	0.0	0.0	6.63	0.38	0.00	0.38	7.02	65.00	9.26
0.00	0.0	0.0	0.0	0.0	7.19	0.38	0.00	0.38	7.59	65.00	8.57

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	1.8	2.0	0.0	0.03	0.01	0.00	0.04	0.08	65.00	99.90
60.00	0.7	1.6	1.8	0.0	0.25	0.02	0.00	0.05	0.27	65.00	99.90
55.00	0.6	1.4	1.5	0.0	0.51	0.04	0.00	0.07	0.55	65.00	99.90
50.00	0.5	1.2	1.3	0.0	0.81	0.05	0.00	0.09	0.86	65.00	75.32
48.00	0.5	1.1	1.2	0.0	0.94	0.06	0.00	0.10	1.00	65.00	64.96
48.00	0.5	1.1	1.2	0.0	0.64	0.04	0.00	0.06	0.68	65.00	96.09
45.00	0.5	1.0	1.1	0.0	0.79	0.05	0.00	0.07	0.84	65.00	77.71
45.00	0.5	1.0	1.1	0.0	0.78	0.10	0.57	0.81	1.64	65.00	39.56
40.00	0.4	0.8	0.9	0.0	1.29	0.11	0.52	0.76	1.85	65.00	35.20
35.00	0.3	0.7	0.7	0.0	2.10	0.12	0.48	0.71	2.42	65.00	26.81
32.00	0.3	0.6	0.6	0.0	2.53	0.13	0.45	0.69	2.82	65.00	23.03
32.00	0.3	0.6	0.6	0.0	2.26	0.22	0.44	0.74	2.76	65.00	23.51
30.00	0.3	0.5	0.6	0.0	2.40	0.22	0.43	0.73	2.88	65.00	22.55
30.00	0.3	0.5	0.6	0.0	2.39	0.22	0.43	0.75	2.90	65.00	22.41
25.00	0.2	0.3	0.4	0.0	3.01	0.23	0.40	0.72	3.41	65.00	19.07
21.25	0.2	0.3	0.3	0.0	3.53	0.24	0.37	0.69	3.90	65.00	16.67
21.25	0.2	0.3	0.3	0.0	3.22	0.31	0.36	0.68	3.66	65.00	17.74
20.00	0.1	0.2	0.3	0.0	3.39	0.31	0.35	0.67	3.83	65.00	16.99
15.00	0.1	0.1	0.2	0.0	4.00	0.32	0.32	0.65	4.42	65.00	14.71
10.00	0.0	0.1	0.1	0.0	4.53	0.33	0.30	0.63	4.94	65.00	13.15
5.00	0.0	0.0	0.0	0.0	5.18	0.33	0.28	0.61	5.54	65.00	11.73
0.00	0.0	0.0	0.0	0.0	5.85	0.34	0.26	0.60	6.22	65.00	10.45

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	1.4	1.5	0.0	3.76	0.03	0.22	0.60	3.91	65.00	16.64
37.50	0.5	1.4	1.5	0.0	3.06	0.03	0.22	0.60	3.22	65.00	20.18
35.00	0.5	1.4	1.5	0.0	2.29	0.03	0.22	0.61	2.54	65.00	25.57
33.00	0.5	1.4	1.5	0.1	2.42	0.03	0.22	0.61	2.66	65.00	24.40
33.00	0.5	1.4	1.5	0.1	2.42	0.00	0.22	0.35	2.49	65.00	26.07
30.00	0.5	1.4	1.5	0.1	2.30	0.00	0.22	0.36	2.38	65.00	27.27
27.50	0.5	1.4	1.5	0.1	2.30	0.00	0.22	0.37	2.38	65.00	27.33
25.00	0.5	1.4	1.5	0.0	2.50	0.00	0.22	0.39	2.58	65.00	25.22
22.50	0.5	1.4	1.5	0.0	2.67	0.00	0.22	0.40	2.75	65.00	23.60
20.00	0.5	1.4	1.4	0.0	2.82	0.00	0.22	0.41	2.91	65.00	22.35
20.00	0.5	1.4	1.4	0.0	2.82	0.03	0.22	0.41	2.87	65.00	22.66
17.50	0.5	1.3	1.4	0.0	2.32	0.03	0.22	0.43	2.40	65.00	27.13
15.00	0.5	1.3	1.4	0.0	2.01	0.03	0.22	0.44	2.11	65.00	30.78
12.50	0.5	1.3	1.3	0.0	1.73	0.03	0.22	0.45	1.86	65.00	35.01
10.00	0.5	1.2	1.3	0.0	1.99	0.03	0.22	0.46	2.10	65.00	30.90
7.00	0.5	1.2	1.2	0.0	2.48	0.03	0.22	0.48	2.57	65.00	25.28
7.00	0.5	1.2	1.2	0.0	2.48	0.06	0.22	0.67	2.69	65.00	24.15
5.00	0.5	1.1	1.2	0.0	3.20	0.06	0.22	0.68	3.28	65.00	19.79
2.50	0.5	1.1	1.2	0.0	4.34	0.06	0.22	0.68	4.40	65.00	14.79
0.00	0.5	1.0	1.1	0.0	5.53	0.06	0.22	0.69	5.58	65.00	11.64

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	1.0	1.1	0.0	4.82	0.05	0.24	0.67	4.91	65.00	13.24
37.50	0.5	1.0	1.1	0.0	3.61	0.05	0.24	0.67	3.80	65.00	17.09
35.00	0.5	1.1	1.2	0.1	2.78	0.05	0.24	0.67	3.01	65.00	21.56
33.00	0.5	1.1	1.2	0.1	2.18	0.05	0.24	0.67	2.52	65.00	25.83
33.00	0.5	1.1	1.2	0.1	2.18	0.08	0.24	0.41	2.37	65.00	27.43
30.00	0.5	1.2	1.3	0.1	2.14	0.08	0.24	0.42	2.34	65.00	27.81
27.50	0.5	1.2	1.3	0.1	2.05	0.08	0.24	0.43	2.25	65.00	28.85
25.00	0.5	1.3	1.4	0.1	2.22	0.08	0.24	0.44	2.40	65.00	27.03
22.50	0.5	1.3	1.4	0.0	2.55	0.08	0.24	0.45	2.73	65.00	23.80
20.00	0.5	1.4	1.4	0.0	2.86	0.08	0.24	0.46	3.04	65.00	21.41
20.00	0.5	1.4	1.4	0.0	2.86	0.11	0.24	0.39	3.01	65.00	21.59
17.50	0.5	1.4	1.5	0.0	2.43	0.11	0.24	0.41	2.62	65.00	24.76
15.00	0.5	1.4	1.5	0.0	2.27	0.11	0.24	0.42	2.49	65.00	26.15
12.50	0.5	1.4	1.5	0.0	2.14	0.11	0.24	0.44	2.37	65.00	27.44
10.00	0.5	1.4	1.5	0.0	2.14	0.11	0.24	0.45	2.35	65.00	27.61
7.00	0.5	1.4	1.5	0.0	2.71	0.11	0.24	0.47	2.90	65.00	22.38
7.00	0.5	1.4	1.5	0.0	2.71	0.13	0.24	0.64	3.05	65.00	21.30
5.00	0.5	1.4	1.5	0.0	2.74	0.13	0.24	0.65	3.09	65.00	21.05
2.50	0.5	1.4	1.5	0.0	3.78	0.13	0.24	0.65	4.01	65.00	16.21
0.00	0.5	1.4	1.5	0.0	4.90	0.13	0.24	0.66	5.11	65.00	12.72

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.8	0.8	0.0	1.02	0.04	0.86	1.03	2.05	65.00	31.72
37.50	0.3	0.8	0.8	0.0	1.50	0.04	0.86	1.01	2.24	65.00	29.02
35.00	0.3	0.8	0.8	0.1	1.92	0.04	0.86	1.00	2.54	65.00	25.57
33.00	0.3	0.7	0.8	0.1	2.22	0.04	0.86	0.98	2.77	65.00	23.43
33.00	0.3	0.7	0.8	0.1	2.34	0.05	0.42	0.45	2.51	65.00	25.87
30.00	0.3	0.7	0.8	0.1	2.30	0.05	0.42	0.45	2.47	65.00	26.32
27.50	0.3	0.7	0.8	0.1	2.20	0.05	0.42	0.45	2.38	65.00	27.36
25.00	0.3	0.7	0.8	0.1	2.05	0.05	0.42	0.47	2.23	65.00	29.16
22.50	0.3	0.7	0.8	0.1	1.84	0.05	0.42	0.48	2.03	65.00	31.99
20.00	0.3	0.7	0.8	0.1	1.58	0.05	0.42	0.50	1.79	65.00	36.40
20.00	0.3	0.7	0.8	0.1	1.70	0.07	0.03	0.22	1.77	65.00	36.65
17.50	0.3	0.7	0.7	0.1	1.03	0.07	0.03	0.24	1.11	65.00	58.67
15.00	0.3	0.7	0.7	0.0	0.41	0.07	0.03	0.25	0.61	65.00	99.90
12.50	0.3	0.7	0.7	0.0	0.68	0.07	0.03	0.27	0.79	65.00	81.82
10.00	0.3	0.6	0.7	0.0	1.44	0.07	0.03	0.29	1.54	65.00	42.33
7.00	0.3	0.6	0.7	0.0	2.43	0.07	0.03	0.31	2.51	65.00	25.87
7.00	0.3	0.6	0.7	0.0	2.54	0.09	0.47	0.86	2.86	65.00	22.76
5.00	0.3	0.6	0.7	0.0	3.52	0.09	0.47	0.88	3.78	65.00	17.19
2.50	0.3	0.6	0.6	0.0	4.80	0.09	0.47	0.89	5.02	65.00	12.95
0.00	0.3	0.6	0.6	0.0	6.13	0.09	0.47	0.91	6.32	65.00	10.28

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.5	0.6	0.0	0.87	0.00	0.45	0.62	1.25	65.00	52.00
37.50	0.3	0.6	0.6	0.0	1.37	0.00	0.45	0.60	1.63	65.00	39.87
35.00	0.3	0.6	0.6	0.1	1.81	0.00	0.45	0.58	2.01	65.00	32.30
33.00	0.3	0.6	0.7	0.1	2.13	0.00	0.45	0.57	2.30	65.00	28.30
33.00	0.3	0.6	0.7	0.1	2.24	0.01	0.01	0.02	2.26	65.00	28.79
30.00	0.3	0.6	0.7	0.1	2.23	0.01	0.01	0.02	2.24	65.00	29.01
27.50	0.3	0.6	0.7	0.1	2.15	0.01	0.01	0.04	2.17	65.00	30.01
25.00	0.3	0.7	0.7	0.1	2.02	0.01	0.01	0.06	2.04	65.00	31.93
22.50	0.3	0.7	0.7	0.1	1.84	0.01	0.01	0.08	1.85	65.00	35.12
20.00	0.3	0.7	0.7	0.1	1.60	0.01	0.01	0.09	1.61	65.00	40.36
20.00	0.3	0.7	0.7	0.1	1.71	0.03	0.43	0.63	1.95	65.00	33.41
17.50	0.3	0.7	0.8	0.1	1.06	0.03	0.43	0.64	1.41	65.00	46.18
15.00	0.3	0.7	0.8	0.0	0.55	0.03	0.43	0.66	1.26	65.00	51.52
12.50	0.3	0.7	0.8	0.0	0.79	0.03	0.43	0.68	1.37	65.00	47.51
10.00	0.3	0.7	0.8	0.0	1.59	0.03	0.43	0.70	1.87	65.00	34.73
7.00	0.3	0.7	0.8	0.0	2.63	0.03	0.43	0.72	2.82	65.00	23.04
7.00	0.3	0.7	0.8	0.0	2.75	0.05	0.87	1.27	3.31	65.00	19.62
5.00	0.3	0.8	0.8	0.0	3.76	0.05	0.87	1.28	4.21	65.00	15.45
2.50	0.3	0.8	0.8	0.0	5.08	0.05	0.87	1.30	5.43	65.00	11.96
0.00	0.3	0.8	0.8	0.0	6.45	0.05	0.87	1.32	6.75	65.00	9.63

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.4	0.4	0.0	0.67	0.05	0.27	0.44	0.86	65.00	75.38
37.50	0.2	0.4	0.4	0.0	1.17	0.05	0.27	0.42	1.27	65.00	51.14
35.00	0.2	0.3	0.4	0.1	1.61	0.05	0.27	0.40	1.70	65.00	38.19
33.00	0.2	0.3	0.4	0.1	1.93	0.05	0.27	0.39	2.01	65.00	32.32
33.00	0.2	0.3	0.4	0.1	1.89	0.03	0.19	0.21	1.95	65.00	33.35
30.00	0.2	0.3	0.4	0.1	1.93	0.03	0.19	0.19	1.99	65.00	32.74
27.50	0.2	0.3	0.4	0.1	1.90	0.03	0.19	0.21	1.96	65.00	33.24
25.00	0.2	0.3	0.4	0.1	1.81	0.03	0.19	0.22	1.87	65.00	34.73
22.50	0.2	0.3	0.4	0.1	1.67	0.03	0.19	0.24	1.73	65.00	37.49
20.00	0.2	0.3	0.4	0.1	1.47	0.03	0.19	0.26	1.54	65.00	42.11
20.00	0.2	0.3	0.4	0.1	1.44	0.02	0.11	0.27	1.48	65.00	43.96
17.50	0.2	0.3	0.4	0.1	0.87	0.02	0.11	0.29	0.94	65.00	69.37
15.00	0.2	0.3	0.3	0.0	0.29	0.02	0.11	0.31	0.59	65.00	99.90
12.50	0.2	0.3	0.3	0.0	0.58	0.02	0.11	0.32	0.69	65.00	94.82
10.00	0.2	0.3	0.3	0.0	1.30	0.02	0.11	0.34	1.36	65.00	47.90
7.00	0.2	0.3	0.3	0.0	2.23	0.02	0.11	0.36	2.27	65.00	28.62
7.00	0.2	0.3	0.3	0.0	2.31	0.00	0.02	0.38	2.32	65.00	28.00
5.00	0.2	0.3	0.3	0.0	3.22	0.00	0.02	0.39	3.23	65.00	20.13
2.50	0.2	0.3	0.3	0.0	4.41	0.00	0.02	0.41	4.41	65.00	14.72
0.00	0.2	0.3	0.3	0.0	5.65	0.00	0.02	0.43	5.66	65.00	11.49

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5TC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	0.2	0.3	0.0	0.73	0.12	0.04	0.20	0.87	65.00	74.38
37.50	0.2	0.3	0.3	0.0	1.23	0.12	0.04	0.18	1.36	65.00	47.85
35.00	0.2	0.3	0.3	0.1	1.66	0.12	0.04	0.17	1.79	65.00	36.26
33.00	0.2	0.3	0.3	0.1	1.97	0.12	0.04	0.15	2.10	65.00	30.94
33.00	0.2	0.3	0.3	0.1	1.94	0.11	0.12	0.14	2.06	65.00	31.57
30.00	0.2	0.3	0.3	0.1	1.97	0.10	0.12	0.12	2.09	65.00	31.15
27.50	0.2	0.3	0.3	0.1	1.93	0.10	0.12	0.14	2.05	65.00	31.72
25.00	0.2	0.3	0.3	0.1	1.84	0.11	0.12	0.16	1.96	65.00	33.22
22.50	0.2	0.3	0.3	0.1	1.70	0.11	0.12	0.17	1.81	65.00	35.92
20.00	0.2	0.3	0.4	0.1	1.49	0.11	0.12	0.19	1.61	65.00	40.43
20.00	0.2	0.3	0.4	0.1	1.46	0.09	0.20	0.37	1.57	65.00	41.42
17.50	0.2	0.3	0.4	0.1	0.90	0.09	0.20	0.39	1.01	65.00	64.28
15.00	0.2	0.3	0.4	0.0	0.31	0.09	0.20	0.41	0.72	65.00	90.04
12.50	0.2	0.3	0.4	0.0	0.59	0.09	0.20	0.43	0.79	65.00	82.60
10.00	0.2	0.3	0.4	0.0	1.32	0.09	0.20	0.44	1.42	65.00	45.82
7.00	0.2	0.3	0.4	0.0	2.26	0.09	0.20	0.46	2.36	65.00	27.57
7.00	0.2	0.3	0.4	0.0	2.34	0.07	0.29	0.64	2.43	65.00	26.79
5.00	0.2	0.3	0.4	0.0	3.26	0.07	0.29	0.66	3.34	65.00	19.45
2.50	0.2	0.3	0.4	0.0	4.46	0.07	0.29	0.68	4.54	65.00	14.32
0.00	0.2	0.4	0.4	0.0	5.72	0.07	0.29	0.69	5.80	65.00	11.22

BY VALMONT INDUSTRIES FOR:
Design Id:Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

The deflection evaluation below is based on Relative translation and rotations.

----- Deflection Evaluation -----									
Member	Point Dist. From Base (ft)	Defl. Horiz. Actual (in)	Horiz. Limit (in)	Defl. Vert. Actual (in)	Vert. Limit (in)	Rot. Horiz. Actual (deg)	Horiz. Limit (deg)	Rot. Vert. Actual (deg)	Vert. Limit (deg)
Arm 1	7.0000	0.21	2.40	0.01	2.40	0.026		0.044	
	7.0000	0.21	2.40	0.01	2.40	0.026		0.044	
	20.0000	0.57	2.40	0.02	2.40	0.055		0.026	
	20.0000	0.57	2.40	0.02	2.40	0.055		0.026	
	33.0000	0.01	2.40	0.02	2.40	0.019		0.008	
	33.0000	0.01	2.40	0.02	2.40	0.019		0.008	
Arm 2	7.0000	0.01	2.40	0.01	2.40	0.026		0.008	
	7.0000	0.01	2.40	0.01	2.40	0.026		0.008	
	20.0000	0.57	2.40	0.02	2.40	0.055		0.026	
	20.0000	0.57	2.40	0.02	2.40	0.055		0.026	
	33.0000	0.21	2.40	0.02	2.40	0.019		0.044	
	33.0000	0.21	2.40	0.02	2.40	0.019		0.044	
Arm 3	7.0000	0.12	2.40	0.01	2.40	0.041		0.007	
	20.0000	0.31	2.40	0.08	2.40	0.021		0.026	
	33.0000	0.00	2.40	0.04	2.40	0.049		0.007	
Arm 4	7.0000	0.00	2.40	0.01	2.40	0.062		0.007	
	20.0000	0.31	2.40	0.08	2.40	0.026		0.026	
	33.0000	0.12	2.40	0.04	2.40	0.019		0.007	
Arm 5	7.0000	0.07	2.40	0.01	2.40	0.035		0.005	
	7.0000	0.07	2.40	0.01	2.40	0.035		0.005	
	20.0000	0.18	2.40	0.07	2.40	0.030		0.024	
	20.0000	0.18	2.40	0.07	2.40	0.030		0.024	
	33.0000	0.01	2.40	0.03	2.40	0.025		0.006	
	33.0000	0.01	2.40	0.03	2.40	0.025		0.006	
Arm 6	7.0000	0.01	2.40	0.01	2.40	0.041		0.006	
	7.0000	0.01	2.40	0.01	2.40	0.041		0.006	
	20.0000	0.18	2.40	0.07	2.40	0.032		0.024	
	20.0000	0.18	2.40	0.07	2.40	0.032		0.024	
	33.0000	0.07	2.40	0.03	2.40	0.014		0.005	
	33.0000	0.07	2.40	0.03	2.40	0.014		0.005	

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	101	347	362	134
60.00	30	-6	31	0	101	571	580	440
55.00	72	-12	73	0	102	807	813	763
50.00	128	-18	129	0	102	1055	1060	1102
48.00	154	-21	156	0	103	1158	1162	1243
48.00	154	-21	156	0	103	1157	1162	1243
45.00	199	-24	200	0	103	1316	1320	1565
45.00	246	0	246	332	-65	5492	5492	1829
40.00	584	4	584	332	-66	5764	5765	2389
35.00	939	8	939	332	-66	6049	6049	2973
32.00	1159	11	1159	332	-66	6226	6226	3335
32.00	1118	-107	1123	407	-637	7511	7538	5267
30.00	1300	-92	1303	407	-637	7632	7658	5513
30.00	1307	-92	1310	407	-638	8100	8125	5714
25.00	1802	-54	1803	407	-639	8405	8429	6352
21.25	2186	-25	2186	407	-639	8645	8668	6844
21.25	2200	-143	2205	471	-635	9811	9817	8684
20.00	2348	-148	2353	471	-633	9887	9893	8856
15.00	2951	-168	2956	471	331	10210	10216	9550
10.00	3574	-188	3579	471	329	10543	10548	10271
5.00	4217	-207	4223	471	326	10885	10890	11017
0.00	4882	-227	4887	471	326	11252	11257	11777

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	100	348	362	133
60.00	30	-6	31	0	100	572	581	439
55.00	72	-12	73	0	100	808	815	762
50.00	128	-18	129	0	100	1057	1062	1102
48.00	154	-20	156	0	100	1160	1164	1242
48.00	154	-20	156	0	100	1160	1164	1242
45.00	199	-24	200	0	100	1319	1322	1564
45.00	104	98	143	0	1314	8332	8435	2601
40.00	612	20	612	0	1314	8606	8706	3162
35.00	1137	-59	1138	0	1314	8891	8987	3748
32.00	1460	-107	1464	0	1314	9068	9163	4110
32.00	1198	13	1198	0	1172	11130	11191	8525
30.00	1466	-15	1466	0	1172	11251	11312	8771
30.00	1473	-15	1473	0	1172	11717	11776	8974
25.00	2186	-85	2187	0	1172	12020	12077	9616
21.25	2732	-138	2735	0	1172	12260	12316	10108
21.25	2615	-43	2615	0	975	14634	14666	14222
20.00	2835	-58	2835	0	975	14705	14737	14400
15.00	3727	-116	3729	0	975	15019	15050	15102
10.00	4639	-175	4642	0	974	15341	15372	15833
5.00	5570	-233	5575	0	973	15671	15701	16591
0.00	6521	-291	6528	0	973	16038	16067	17350

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	3	0	3	0	99	348	362	134
60.00	30	-6	31	0	99	572	580	440
55.00	72	-12	73	0	99	807	813	763
50.00	128	-18	129	0	98	1055	1060	1102
48.00	154	-20	156	0	98	1158	1162	1243
48.00	154	-20	156	0	98	1158	1162	1243
45.00	199	-24	200	0	98	1316	1320	1565
45.00	246	78	258	-332	1453	5494	5683	2346
40.00	584	-10	584	-332	1454	5766	5946	2906
35.00	939	-97	944	-332	1455	6050	6222	3490
32.00	1160	-149	1169	-332	1455	6227	6395	3852
32.00	1118	89	1122	-408	2171	7513	7820	6284
30.00	1300	37	1300	-408	2171	7633	7936	6530
30.00	1307	37	1307	-408	2171	8101	8387	6731
25.00	1802	-94	1805	-408	2173	8405	8681	7370
21.25	2186	-191	2194	-408	2173	8644	8913	7861
21.25	2201	23	2201	-471	1397	9810	9909	10099
20.00	2348	2	2348	-471	1398	9885	9984	10272
15.00	2951	-82	2952	-471	1400	10206	10302	10966
10.00	3574	-166	3578	-471	1401	10537	10630	11686
5.00	4217	-250	4224	-471	1402	10878	10968	12433
0.00	4881	-334	4892	-471	1402	11244	11331	13192

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-171	23	172	48	-260	3507	3516	159
37.50	-67	29	73	48	-136	3382	3385	159
35.00	32	31	45	48	-12	3258	3258	159
33.00	109	30	113	48	87	3158	3159	159
33.00	109	30	113	48	-230	1261	1282	559
30.00	152	36	156	48	-81	1111	1114	560
27.50	183	36	187	48	43	987	988	560
25.00	211	33	214	48	167	862	878	560
22.50	235	26	237	48	291	738	793	561
20.00	255	16	256	48	415	613	741	561
20.00	255	16	256	48	100	-1285	1289	958
17.50	215	11	215	48	224	-1410	1427	958
15.00	171	2	171	48	348	-1534	1573	957
12.50	123	-10	123	48	473	-1659	1725	956
10.00	71	-26	76	48	597	-1783	1881	956
7.00	4	-50	50	48	746	-1933	2072	956
7.00	4	-50	50	48	432	-3831	3856	1351
5.00	-89	-62	108	48	531	-3931	3967	1351
2.50	-209	-80	223	48	656	-4054	4107	1353
0.00	-332	-101	347	48	780	-4179	4251	1353

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-332	25	333	-48	-263	4176	4184	166
37.50	-208	31	211	-48	-139	4052	4054	166
35.00	-89	33	95	-48	-14	3928	3928	165
33.00	4	32	33	-48	85	3828	3829	164
33.00	4	32	33	-48	-229	1932	1945	569
30.00	71	38	81	-48	-79	1782	1784	570
27.50	123	38	129	-48	45	1658	1659	570
25.00	171	35	174	-48	169	1533	1543	570
22.50	215	28	217	-48	294	1409	1439	571
20.00	255	17	256	-48	418	1284	1351	571
20.00	255	17	256	-48	103	-613	621	974
17.50	235	13	235	-48	227	-737	771	974
15.00	211	4	211	-48	351	-862	931	974
12.50	183	-9	184	-48	474	-987	1095	973
10.00	152	-25	154	-48	599	-1112	1263	973
7.00	109	-49	120	-48	747	-1261	1466	973
7.00	109	-49	120	-48	431	-3159	3188	1372
5.00	32	-60	68	-48	530	-3259	3301	1372
2.50	-67	-78	103	-48	653	-3383	3445	1373
0.00	-171	-100	198	-48	777	-3507	3592	1373

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-14	-125	125	131	-1956	1031	2211	714
37.50	15	-68	70	131	-1832	907	2044	714
35.00	41	-15	43	131	-1708	781	1878	714
33.00	58	25	63	131	-1609	682	1747	714
33.00	58	25	63	74	-809	572	991	715
30.00	76	52	92	74	-660	422	784	715
27.50	87	69	111	74	-536	298	613	715
25.00	94	84	126	74	-412	174	447	715
22.50	97	94	135	74	-287	49	292	715
20.00	97	101	140	74	-163	-75	179	715
20.00	97	101	140	16	636	-184	663	715
17.50	89	80	120	16	761	-308	821	715
15.00	78	55	96	16	885	-433	985	715
12.50	63	27	69	16	1010	-557	1153	714
10.00	45	-5	45	16	1134	-681	1323	714
7.00	18	-49	52	16	1283	-830	1528	714
7.00	18	-49	52	-42	2083	-939	2285	714
5.00	-6	-100	100	-42	2182	-1039	2417	714
2.50	-39	-167	172	-42	2306	-1163	2583	715
0.00	-76	-238	250	-42	2430	-1287	2750	715

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-76	-118	140	42	-1930	1287	2319	571
37.50	-39	-62	73	42	-1805	1163	2147	571
35.00	-6	-9	11	42	-1681	1038	1976	570
33.00	18	30	35	42	-1582	939	1840	570
33.00	18	30	35	-16	-782	830	1140	571
30.00	45	55	71	-16	-633	681	930	571
27.50	64	72	96	-16	-509	557	754	571
25.00	78	86	116	-16	-384	432	578	571
22.50	89	95	131	-16	-260	308	403	572
20.00	97	101	140	-16	-135	184	229	572
20.00	97	101	140	-74	664	75	668	572
17.50	97	79	125	-74	788	-50	790	571
15.00	94	54	108	-74	913	-174	929	571
12.50	87	25	90	-74	1037	-298	1079	571
10.00	76	-8	76	-74	1161	-423	1236	571
7.00	58	-53	79	-74	1310	-572	1430	571
7.00	58	-53	79	-131	2109	-683	2217	571
5.00	40	-105	112	-131	2208	-783	2343	571
2.50	15	-173	173	-131	2332	-908	2502	572
0.00	-14	-245	245	-131	2456	-1032	2664	572

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-67	-124	141	59	-1855	1189	2203	-778
37.50	-34	-70	78	59	-1731	1065	2032	-778
35.00	-4	-20	20	59	-1606	941	1861	-778
33.00	18	18	25	59	-1507	841	1726	-778
33.00	18	18	25	44	-807	716	1079	-777
30.00	41	44	60	44	-658	567	869	-777
27.50	56	62	83	44	-534	443	694	-777
25.00	67	76	102	44	-410	319	519	-777
22.50	75	86	114	44	-285	195	346	-777
20.00	79	93	122	44	-161	71	176	-777
20.00	79	93	122	29	538	-54	541	-777
17.50	76	75	107	29	663	-178	686	-777
15.00	68	53	87	29	787	-302	843	-777
12.50	58	28	64	29	912	-425	1006	-777
10.00	43	-1	43	29	1036	-549	1173	-777
7.00	20	-41	46	29	1186	-698	1376	-778
7.00	20	-41	46	15	1885	-823	2057	-778
5.00	0	-88	88	15	1985	-922	2188	-778
2.50	-30	-149	152	15	2109	-1046	2354	-778
0.00	-63	-214	224	15	2234	-1170	2522	-777

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-63	-119	134	-15	-1836	1169	2177	-975
37.50	-30	-65	72	-15	-1712	1045	2006	-975
35.00	0	-16	16	-15	-1587	922	1835	-975
33.00	21	21	29	-15	-1487	822	1700	-975
33.00	21	21	29	-29	-788	698	1053	-975
30.00	43	47	63	-29	-639	549	842	-975
27.50	58	64	86	-29	-514	425	667	-975
25.00	68	78	103	-29	-390	301	493	-975
22.50	76	87	116	-29	-265	177	319	-975
20.00	79	93	122	-29	-141	54	151	-974
20.00	79	93	122	-44	558	-71	563	-975
17.50	75	75	106	-44	683	-195	710	-975
15.00	67	53	85	-44	807	-319	868	-975
12.50	56	26	62	-44	931	-443	1031	-975
10.00	41	-3	41	-44	1056	-567	1198	-975
7.00	18	-44	48	-44	1205	-716	1402	-975
7.00	18	-44	47	-59	1904	-842	2082	-975
5.00	-4	-91	91	-59	2004	-941	2214	-975
2.50	-34	-153	157	-59	2128	-1065	2380	-975
0.00	-68	-219	229	-59	2253	-1190	2547	-974

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	4.2	4.2	0.0	0.03	0.01	0.00	0.04	0.07	65.00	99.90
60.00	0.2	3.7	3.7	0.0	0.30	0.02	0.00	0.06	0.32	65.00	99.90
55.00	0.2	3.3	3.3	0.0	0.63	0.04	0.00	0.08	0.67	65.00	97.41
50.00	0.1	2.8	2.8	0.0	1.00	0.05	0.00	0.10	1.06	65.00	61.41
48.00	0.1	2.6	2.6	0.0	1.16	0.06	0.00	0.11	1.22	65.00	53.07
48.00	0.1	2.6	2.6	0.0	0.79	0.04	0.00	0.08	0.83	65.00	78.50
45.00	0.1	2.4	2.4	0.0	0.96	0.05	0.00	0.08	1.01	65.00	64.63
45.00	0.1	2.4	2.4	0.0	1.15	0.06	0.78	1.13	1.99	65.00	32.58
40.00	0.1	1.9	1.9	0.0	2.49	0.07	0.71	1.06	2.91	65.00	22.34
35.00	0.1	1.5	1.5	0.0	3.67	0.09	0.65	1.00	3.95	65.00	16.44
32.00	0.1	1.3	1.3	0.0	4.31	0.09	0.62	0.97	4.55	65.00	14.28
32.00	0.1	1.3	1.3	0.0	4.25	0.15	0.76	1.19	4.67	65.00	13.92
30.00	0.1	1.2	1.2	0.0	4.75	0.15	0.74	1.16	5.13	65.00	12.66
30.00	0.1	1.2	1.2	0.0	4.77	0.16	0.74	1.19	5.17	65.00	12.58
25.00	0.0	0.8	0.8	0.0	6.01	0.17	0.68	1.13	6.34	65.00	10.25
21.25	0.0	0.6	0.6	0.0	6.85	0.18	0.64	1.09	7.15	65.00	9.09
21.25	0.0	0.6	0.6	0.0	6.99	0.22	0.74	1.25	7.37	65.00	8.83
20.00	0.0	0.6	0.6	0.0	7.32	0.22	0.73	1.24	7.68	65.00	8.46
15.00	0.0	0.3	0.3	0.0	8.52	0.23	0.68	1.18	8.86	65.00	7.33
10.00	0.0	0.1	0.1	0.0	9.60	0.24	0.63	1.13	9.92	65.00	6.55
5.00	0.0	0.0	0.0	0.0	10.56	0.25	0.59	1.09	10.88	65.00	5.97
0.00	0.0	0.0	0.0	0.0	11.42	0.26	0.55	1.05	11.74	65.00	5.54

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	5.2	5.2	0.0	0.03	0.01	0.00	0.04	0.07	65.00	99.90
60.00	0.2	4.7	4.7	0.0	0.30	0.02	0.00	0.06	0.32	65.00	99.90
55.00	0.1	4.1	4.1	0.0	0.63	0.04	0.00	0.08	0.67	65.00	97.32
50.00	0.1	3.6	3.6	0.0	1.01	0.05	0.00	0.10	1.06	65.00	61.34
48.00	0.1	3.3	3.3	0.0	1.17	0.06	0.00	0.11	1.23	65.00	53.01
48.00	0.1	3.3	3.3	0.0	0.79	0.04	0.00	0.08	0.83	65.00	78.41
45.00	0.1	3.0	3.0	0.0	0.96	0.05	0.00	0.08	1.01	65.00	64.56
45.00	0.1	3.0	3.0	0.0	0.69	0.08	0.00	0.53	1.14	65.00	57.21
40.00	0.1	2.5	2.5	0.0	2.63	0.09	0.00	0.52	2.74	65.00	23.69
35.00	0.1	2.0	2.0	0.0	4.49	0.11	0.00	0.52	4.60	65.00	14.12
32.00	0.1	1.7	1.7	0.0	5.52	0.11	0.00	0.51	5.63	65.00	11.54
32.00	0.1	1.7	1.7	0.0	4.45	0.24	0.00	0.63	4.71	65.00	13.81
30.00	0.1	1.5	1.5	0.0	5.27	0.24	0.00	0.62	5.52	65.00	11.78
30.00	0.1	1.5	1.5	0.0	5.30	0.25	0.00	0.65	5.55	65.00	11.72
25.00	0.0	1.1	1.1	0.0	7.31	0.25	0.00	0.64	7.57	65.00	8.59
21.25	0.0	0.8	0.8	0.0	8.65	0.26	0.00	0.64	8.91	65.00	7.30
21.25	0.0	0.8	0.8	0.0	8.20	0.36	0.00	0.76	8.57	65.00	7.58
20.00	0.0	0.7	0.7	0.0	8.73	0.37	0.00	0.76	9.10	65.00	7.14
15.00	0.0	0.4	0.4	0.0	10.69	0.37	0.00	0.74	11.06	65.00	5.88
10.00	0.0	0.2	0.2	0.0	12.41	0.37	0.00	0.73	12.78	65.00	5.08
5.00	0.0	0.0	0.0	0.0	13.92	0.38	0.00	0.72	14.30	65.00	4.55
0.00	0.0	0.0	0.0	0.0	15.25	0.38	0.00	0.72	15.64	65.00	4.16

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.2	4.2	4.2	0.0	0.03	0.01	0.00	0.04	0.07	65.00	99.90
60.00	0.2	3.7	3.7	0.0	0.30	0.02	0.00	0.06	0.32	65.00	99.90
55.00	0.1	3.3	3.3	0.0	0.63	0.04	0.00	0.08	0.67	65.00	97.44
50.00	0.1	2.8	2.8	0.0	1.00	0.05	0.00	0.10	1.06	65.00	61.43
48.00	0.1	2.6	2.6	0.0	1.16	0.06	0.00	0.11	1.22	65.00	53.09
48.00	0.1	2.6	2.6	0.0	0.79	0.04	0.00	0.08	0.83	65.00	78.54
45.00	0.1	2.4	2.4	0.0	0.96	0.05	0.00	0.08	1.01	65.00	64.67
45.00	0.1	2.4	2.4	0.0	1.25	0.07	0.78	1.14	2.23	65.00	29.17
40.00	0.1	1.9	1.9	0.0	2.50	0.09	0.71	1.07	2.99	65.00	21.75
35.00	0.1	1.5	1.5	0.0	3.76	0.10	0.65	1.01	4.02	65.00	16.17
32.00	0.1	1.3	1.3	0.0	4.45	0.11	0.62	0.98	4.68	65.00	13.90
32.00	0.1	1.3	1.3	0.0	4.23	0.18	0.76	1.21	4.73	65.00	13.74
30.00	0.1	1.2	1.2	0.0	4.70	0.18	0.74	1.18	5.16	65.00	12.61
30.00	0.1	1.2	1.2	0.0	4.72	0.18	0.74	1.20	5.19	65.00	12.53
25.00	0.0	0.8	0.8	0.0	6.05	0.19	0.68	1.15	6.35	65.00	10.23
21.25	0.0	0.6	0.6	0.0	6.99	0.20	0.64	1.11	7.27	65.00	8.94
21.25	0.0	0.6	0.6	0.0	6.89	0.26	0.74	1.25	7.34	65.00	8.86
20.00	0.0	0.6	0.6	0.0	7.20	0.26	0.73	1.24	7.63	65.00	8.52
15.00	0.0	0.3	0.3	0.0	8.46	0.27	0.68	1.18	8.79	65.00	7.39
10.00	0.0	0.1	0.1	0.0	9.58	0.28	0.63	1.13	9.91	65.00	6.56
5.00	0.0	0.0	0.0	0.0	10.59	0.28	0.59	1.09	10.91	65.00	5.96
0.00	0.0	0.0	0.0	0.0	11.49	0.29	0.55	1.05	11.81	65.00	5.50

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	3.0	3.0	0.0	2.65	0.01	0.37	0.86	2.83	65.00	23.00
37.50	0.1	3.0	3.0	0.0	1.17	0.01	0.37	0.84	1.62	65.00	40.05
35.00	0.1	3.0	3.0	0.0	0.66	0.01	0.37	0.82	1.51	65.00	43.16
33.00	0.1	3.0	3.0	0.0	1.79	0.01	0.37	0.81	2.01	65.00	32.28
33.00	0.1	3.0	3.0	0.0	1.79	0.04	0.37	0.54	1.91	65.00	33.97
30.00	0.1	3.0	3.0	0.0	2.45	0.04	0.37	0.52	2.55	65.00	25.50
27.50	0.1	3.0	3.0	0.0	2.92	0.04	0.37	0.50	3.00	65.00	21.65
25.00	0.1	3.0	3.0	0.0	3.31	0.04	0.37	0.49	3.38	65.00	19.21
22.50	0.1	3.0	3.0	0.0	3.62	0.04	0.37	0.48	3.69	65.00	17.62
20.00	0.1	2.9	2.9	0.0	3.85	0.04	0.37	0.47	3.92	65.00	16.59
20.00	0.1	2.9	2.9	0.0	3.85	0.07	0.37	0.54	3.98	65.00	16.32
17.50	0.1	2.9	2.9	0.0	3.23	0.07	0.37	0.56	3.37	65.00	19.30
15.00	0.1	2.8	2.8	0.0	2.52	0.07	0.37	0.58	2.68	65.00	24.24
12.50	0.1	2.8	2.8	0.0	1.87	0.07	0.37	0.61	2.01	65.00	32.31
10.00	0.1	2.7	2.7	0.0	1.21	0.07	0.37	0.63	1.47	65.00	44.12
7.00	0.1	2.6	2.6	0.0	0.77	0.07	0.37	0.65	1.33	65.00	48.80
7.00	0.1	2.6	2.6	0.0	0.77	0.09	0.37	0.90	1.70	65.00	38.34
5.00	0.1	2.5	2.5	0.0	1.68	0.09	0.37	0.92	1.99	65.00	32.60
2.50	0.1	2.4	2.4	0.0	3.55	0.09	0.37	0.94	3.66	65.00	17.74
0.00	0.1	2.4	2.4	0.0	5.50	0.09	0.37	0.96	5.60	65.00	11.60

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	2.4	2.4	0.0	5.03	0.01	0.37	0.95	5.15	65.00	12.62
37.50	0.1	2.4	2.4	0.0	3.25	0.01	0.37	0.93	3.42	65.00	19.00
35.00	0.1	2.5	2.5	0.0	1.50	0.01	0.37	0.91	1.83	65.00	35.43
33.00	0.1	2.6	2.6	0.0	0.50	0.01	0.37	0.90	1.63	65.00	39.79
33.00	0.1	2.6	2.6	0.0	0.50	0.04	0.37	0.64	1.21	65.00	53.52
30.00	0.1	2.7	2.7	0.0	1.28	0.04	0.37	0.61	1.53	65.00	42.44
27.50	0.1	2.8	2.8	0.0	2.04	0.04	0.37	0.60	2.23	65.00	29.19
25.00	0.1	2.8	2.8	0.0	2.72	0.04	0.37	0.58	2.88	65.00	22.56
22.50	0.1	2.9	2.9	0.0	3.33	0.04	0.37	0.57	3.47	65.00	18.73
20.00	0.1	2.9	2.9	0.0	3.86	0.04	0.37	0.55	3.99	65.00	16.29
20.00	0.1	2.9	2.9	0.0	3.86	0.07	0.37	0.45	3.97	65.00	16.36
17.50	0.1	3.0	3.0	0.0	3.53	0.07	0.37	0.47	3.65	65.00	17.80
15.00	0.1	3.0	3.0	0.0	3.13	0.07	0.37	0.50	3.26	65.00	19.97
12.50	0.1	3.0	3.0	0.0	2.75	0.07	0.37	0.52	2.93	65.00	22.16
10.00	0.1	3.0	3.0	0.0	2.38	0.07	0.37	0.54	2.60	65.00	25.01
7.00	0.1	3.0	3.0	0.0	1.90	0.07	0.37	0.57	2.17	65.00	29.93
7.00	0.1	3.0	3.0	0.0	1.90	0.09	0.37	0.81	2.24	65.00	28.99
5.00	0.1	3.0	3.0	0.0	1.08	0.09	0.37	0.83	1.84	65.00	35.41
2.50	0.1	3.0	3.0	0.0	1.56	0.09	0.37	0.85	2.12	65.00	30.67
0.00	0.1	3.0	3.0	0.0	3.12	0.09	0.37	0.87	3.30	65.00	19.67

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.7	1.7	0.0	1.92	0.05	1.01	1.31	2.80	65.00	23.19
37.50	0.1	1.7	1.7	0.0	1.09	0.05	1.01	1.29	2.40	65.00	27.09
35.00	0.1	1.7	1.7	0.0	0.69	0.05	1.01	1.27	2.31	65.00	28.10
33.00	0.1	1.7	1.7	0.0	1.01	0.05	1.01	1.25	2.31	65.00	28.10
33.00	0.1	1.7	1.7	0.0	1.01	0.05	0.56	0.70	1.53	65.00	42.57
30.00	0.1	1.7	1.7	0.1	1.43	0.05	0.56	0.67	1.83	65.00	35.44
27.50	0.1	1.7	1.7	0.1	1.70	0.05	0.56	0.65	2.05	65.00	31.74
25.00	0.1	1.7	1.7	0.1	1.89	0.05	0.56	0.63	2.21	65.00	29.48
22.50	0.1	1.6	1.7	0.1	2.00	0.05	0.56	0.60	2.30	65.00	28.29
20.00	0.1	1.6	1.6	0.1	2.07	0.05	0.56	0.59	2.35	65.00	27.67
20.00	0.1	1.6	1.6	0.1	2.07	0.05	0.12	0.21	2.13	65.00	30.50
17.50	0.1	1.6	1.6	0.1	1.80	0.05	0.12	0.24	1.85	65.00	35.11
15.00	0.1	1.6	1.6	0.1	1.49	0.05	0.12	0.26	1.54	65.00	42.28
12.50	0.1	1.5	1.5	0.1	1.10	0.05	0.12	0.28	1.15	65.00	56.73
10.00	0.1	1.5	1.5	0.0	0.69	0.05	0.12	0.31	0.83	65.00	78.14
7.00	0.1	1.4	1.4	0.0	0.82	0.05	0.12	0.34	0.93	65.00	69.77
7.00	0.1	1.4	1.4	0.0	0.82	0.05	0.32	0.64	1.30	65.00	49.98
5.00	0.1	1.4	1.4	0.0	1.51	0.05	0.32	0.66	1.78	65.00	36.56
2.50	0.1	1.4	1.4	0.0	2.70	0.05	0.32	0.68	2.81	65.00	23.14
0.00	0.1	1.3	1.3	0.0	3.96	0.05	0.32	0.70	4.06	65.00	16.01

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.3	1.3	0.0	2.19	0.04	0.32	0.64	2.33	65.00	27.93
37.50	0.1	1.4	1.4	0.0	1.15	0.04	0.32	0.62	1.35	65.00	48.20
35.00	0.1	1.4	1.4	0.0	0.18	0.04	0.32	0.59	1.03	65.00	63.09
33.00	0.1	1.4	1.4	0.0	0.54	0.04	0.32	0.58	1.00	65.00	65.09
33.00	0.1	1.4	1.4	0.0	0.54	0.04	0.12	0.28	0.67	65.00	97.53
30.00	0.1	1.5	1.5	0.1	1.08	0.04	0.12	0.25	1.16	65.00	55.89
27.50	0.1	1.5	1.5	0.1	1.45	0.04	0.12	0.23	1.51	65.00	42.91
25.00	0.1	1.6	1.6	0.1	1.74	0.04	0.12	0.20	1.80	65.00	36.21
22.50	0.1	1.6	1.6	0.1	1.95	0.04	0.12	0.18	2.00	65.00	32.49
20.00	0.1	1.6	1.6	0.1	2.08	0.04	0.12	0.15	2.13	65.00	30.52
20.00	0.1	1.6	1.6	0.1	2.08	0.04	0.56	0.66	2.37	65.00	27.44
17.50	0.1	1.6	1.7	0.1	1.91	0.04	0.56	0.67	2.26	65.00	28.72
15.00	0.1	1.7	1.7	0.1	1.71	0.04	0.56	0.69	2.10	65.00	30.97
12.50	0.1	1.7	1.7	0.1	1.43	0.04	0.56	0.71	1.88	65.00	34.56
10.00	0.1	1.7	1.7	0.0	1.17	0.04	0.56	0.74	1.75	65.00	37.04
7.00	0.1	1.7	1.7	0.0	1.18	0.04	0.56	0.76	1.79	65.00	36.22
7.00	0.1	1.7	1.7	0.0	1.17	0.04	1.01	1.31	2.58	65.00	25.22
5.00	0.1	1.7	1.7	0.0	1.79	0.04	1.01	1.33	2.80	65.00	23.25
2.50	0.1	1.7	1.7	0.0	2.63	0.04	1.01	1.35	3.43	65.00	18.93
0.00	0.1	1.7	1.7	0.0	3.68	0.04	1.01	1.38	4.17	65.00	15.57

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	0.8	0.8	0.0	2.23	0.05	0.45	0.76	2.38	65.00	27.29
37.50	0.0	0.8	0.8	0.0	1.23	0.05	0.45	0.73	1.46	65.00	44.42
35.00	0.0	0.8	0.8	0.0	0.31	0.05	0.45	0.71	1.23	65.00	52.95
33.00	0.0	0.8	0.8	0.0	0.37	0.05	0.45	0.69	1.19	65.00	54.41
33.00	0.0	0.8	0.8	0.0	0.37	0.05	0.34	0.49	0.85	65.00	76.91
30.00	0.0	0.8	0.8	0.1	0.89	0.05	0.34	0.46	1.15	65.00	56.63
27.50	0.0	0.8	0.8	0.1	1.25	0.05	0.34	0.43	1.45	65.00	44.90
25.00	0.0	0.8	0.8	0.1	1.53	0.05	0.34	0.41	1.70	65.00	38.33
22.50	0.0	0.8	0.8	0.1	1.73	0.05	0.34	0.38	1.88	65.00	34.61
20.00	0.0	0.8	0.8	0.1	1.85	0.05	0.34	0.36	1.99	65.00	32.66
20.00	0.0	0.8	0.8	0.1	1.85	0.05	0.22	0.30	1.95	65.00	33.34
17.50	0.0	0.8	0.8	0.1	1.57	0.05	0.22	0.32	1.70	65.00	38.16
15.00	0.0	0.8	0.8	0.1	1.33	0.05	0.22	0.34	1.48	65.00	43.80
12.50	0.0	0.7	0.7	0.0	1.02	0.05	0.22	0.36	1.20	65.00	54.04
10.00	0.0	0.7	0.7	0.0	0.64	0.05	0.22	0.39	0.96	65.00	67.43
7.00	0.0	0.7	0.7	0.0	0.73	0.05	0.22	0.42	1.02	65.00	63.56
7.00	0.0	0.7	0.7	0.0	0.73	0.05	0.11	0.40	0.96	65.00	67.56
5.00	0.0	0.7	0.7	0.0	1.29	0.05	0.11	0.42	1.46	65.00	44.44
2.50	0.0	0.6	0.6	0.0	2.38	0.05	0.11	0.44	2.44	65.00	26.64
0.00	0.0	0.6	0.6	0.0	3.54	0.05	0.11	0.46	3.60	65.00	18.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 5LC2 Deflection

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.0	0.6	0.6	0.0	2.13	0.07	0.11	0.42	2.21	65.00	29.39
37.50	0.0	0.6	0.6	0.0	1.14	0.07	0.11	0.39	1.24	65.00	52.48
35.00	0.0	0.7	0.7	0.0	0.24	0.07	0.11	0.37	0.67	65.00	97.60
33.00	0.0	0.7	0.7	0.0	0.43	0.07	0.11	0.35	0.67	65.00	96.97
33.00	0.0	0.7	0.7	0.0	0.43	0.07	0.22	0.37	0.70	65.00	92.25
30.00	0.0	0.7	0.7	0.1	0.95	0.07	0.22	0.34	1.09	65.00	59.43
27.50	0.0	0.7	0.7	0.1	1.29	0.07	0.22	0.32	1.40	65.00	46.43
25.00	0.0	0.8	0.8	0.1	1.56	0.07	0.22	0.29	1.66	65.00	39.10
22.50	0.0	0.8	0.8	0.1	1.75	0.07	0.22	0.27	1.85	65.00	35.14
20.00	0.0	0.8	0.8	0.1	1.86	0.07	0.22	0.25	1.96	65.00	33.14
20.00	0.0	0.8	0.8	0.1	1.86	0.07	0.34	0.42	2.00	65.00	32.52
17.50	0.0	0.8	0.8	0.1	1.56	0.07	0.34	0.44	1.72	65.00	37.81
15.00	0.0	0.8	0.8	0.1	1.31	0.07	0.34	0.46	1.44	65.00	44.99
12.50	0.0	0.8	0.8	0.0	0.98	0.07	0.34	0.48	1.19	65.00	54.85
10.00	0.0	0.8	0.8	0.0	0.62	0.07	0.34	0.50	1.03	65.00	62.96
7.00	0.0	0.8	0.8	0.0	0.76	0.07	0.34	0.53	1.10	65.00	59.23
7.00	0.0	0.8	0.8	0.0	0.76	0.07	0.45	0.74	1.37	65.00	47.29
5.00	0.0	0.8	0.8	0.0	1.36	0.07	0.45	0.76	1.71	65.00	37.96
2.50	0.0	0.8	0.8	0.0	2.45	0.07	0.45	0.78	2.63	65.00	24.76
0.00	0.0	0.8	0.8	0.0	3.63	0.07	0.45	0.80	3.76	65.00	17.28

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	704	201	732	1635
60.00	12	-42	44	0	704	202	733	1941
55.00	24	-85	88	0	705	202	733	2263
50.00	36	-127	132	0	705	202	734	2603
48.00	41	-144	150	0	706	202	734	2744
48.00	41	-144	150	0	705	202	734	2744
45.00	48	-169	176	0	706	202	734	3066
45.00	55	-614	616	60	-2722	984	2894	11158
40.00	114	-450	464	60	-2721	984	2894	11715
35.00	173	-287	335	60	-2726	983	2897	12297
32.00	208	-189	281	60	-2725	983	2897	12658
32.00	127	-95	159	57	2191	996	2407	13697
30.00	151	-148	211	57	2191	996	2407	13944
30.00	151	-148	211	57	2190	996	2406	14144
25.00	211	-279	350	57	2190	995	2405	14777
21.25	256	-378	456	57	2190	995	2406	15268
21.25	244	-325	406	54	3700	997	3832	16394
20.00	259	-381	460	54	3699	996	3830	16561
15.00	319	-603	682	54	3696	995	3827	17245
10.00	378	-824	907	54	3692	993	3823	17955
5.00	438	-1046	1134	54	3687	991	3817	18690
0.00	497	-1267	1361	54	3687	991	3818	19450

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	703	202	731	1635
60.00	12	-42	44	0	703	202	732	1941
55.00	24	-84	88	0	703	203	732	2264
50.00	36	-127	132	0	704	203	732	2603
48.00	41	-144	149	0	704	203	733	2744
48.00	41	-144	149	0	704	203	732	2744
45.00	49	-169	176	0	704	203	733	3066
45.00	36	430	431	0	6122	1679	6348	22560
40.00	136	62	150	0	6124	1678	6349	23117
35.00	237	-305	386	0	6122	1676	6348	23700
32.00	297	-526	604	0	6123	1676	6348	24062
32.00	114	41	122	0	5390	1652	5638	28409
30.00	154	-88	177	0	5391	1652	5638	28656
30.00	154	-88	177	0	5389	1651	5636	28856
25.00	253	-411	483	0	5386	1649	5632	29490
21.25	327	-654	731	0	5386	1649	5633	29981
21.25	286	-211	355	0	4465	1646	4759	34078
20.00	310	-278	417	0	4462	1644	4755	34246
15.00	409	-545	682	0	4456	1639	4748	34930
10.00	507	-813	958	0	4448	1634	4738	35641
5.00	606	-1080	1238	0	4437	1628	4726	36376
0.00	703	-1346	1519	0	4437	1628	4727	37135

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	702	202	731	1635
60.00	12	-42	44	0	702	202	731	1941
55.00	24	-84	88	0	703	202	731	2264
50.00	36	-126	132	0	703	203	731	2604
48.00	41	-143	149	0	703	203	732	2744
48.00	41	-143	149	0	703	203	731	2744
45.00	49	-169	175	0	703	203	732	3067
45.00	55	892	894	-61	8967	985	9021	13669
40.00	114	354	372	-61	8968	986	9022	14227
35.00	173	-184	253	-61	8971	983	9025	14807
32.00	209	-507	549	-61	8972	984	9026	15169
32.00	127	-32	131	-58	4797	997	4899	18587
30.00	151	-147	211	-58	4797	997	4899	18833
30.00	151	-147	211	-58	4796	996	4898	19033
25.00	211	-435	483	-58	4794	995	4896	19667
21.25	256	-650	699	-58	4794	995	4896	20158
21.25	244	-256	354	-55	4208	997	4324	23140
20.00	259	-319	411	-55	4206	995	4322	23308
15.00	319	-572	654	-55	4202	993	4318	23992
10.00	378	-824	906	-55	4196	990	4311	24702
5.00	438	-1076	1161	-55	4189	987	4304	25437
0.00	497	-1327	1417	-55	4189	987	4304	26197

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-49	-550	552	7	-8493	738	8525	3137
37.50	-27	-297	298	7	-8367	738	8400	3137
35.00	-5	-47	48	7	-8244	738	8277	3132
33.00	13	149	150	7	-8144	738	8178	3132
33.00	13	149	150	7	-2448	232	2458	4846
30.00	21	235	236	7	-2295	231	2307	4847
27.50	28	302	303	7	-2168	231	2180	4849
25.00	35	365	366	7	-2040	230	2053	4850
22.50	42	424	426	7	-1911	230	1925	4851
20.00	49	480	482	7	-1786	230	1801	4851
20.00	49	480	482	7	3919	-277	3928	6547
17.50	40	360	362	7	4044	-277	4053	6547
15.00	32	237	239	7	4173	-277	4182	6544
12.50	24	110	112	7	4300	-278	4309	6543
10.00	15	-21	26	7	4427	-278	4435	6541
7.00	5	-183	183	7	4576	-278	4585	6541
7.00	5	-183	183	7	10277	-784	10307	8233
5.00	-14	-431	431	7	10371	-784	10401	8240
2.50	-37	-744	745	7	10486	-783	10515	8253
0.00	-61	-1061	1062	7	10611	-783	10640	8253

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-60	-444	448	-7	-8093	782	8131	3424
37.50	-37	-203	207	-7	-7968	782	8007	3424
35.00	-13	34	36	-7	-7844	782	7883	3422
33.00	5	221	221	-7	-7744	782	7784	3422
33.00	5	221	221	-7	-2047	278	2066	5137
30.00	15	292	292	-7	-1894	277	1915	5138
27.50	24	347	348	-7	-1766	277	1788	5140
25.00	32	398	399	-7	-1638	277	1661	5141
22.50	40	445	447	-7	-1509	276	1534	5142
20.00	49	489	491	-7	-1384	276	1411	5142
20.00	49	489	491	-7	4322	-230	4328	6837
17.50	42	357	359	-7	4447	-230	4453	6836
15.00	35	222	224	-7	4576	-230	4582	6834
12.50	28	82	87	-7	4703	-231	4709	6832
10.00	21	-61	64	-7	4829	-231	4835	6831
7.00	13	-237	237	-7	4979	-232	4984	6831
7.00	13	-237	237	-7	10678	-738	10704	8523
5.00	-5	-495	495	-7	10771	-739	10797	8532
2.50	-27	-820	820	-7	10885	-738	10910	8547
0.00	-49	-1148	1149	-7	11010	-739	11035	8547

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	9	106	106	92	-985	-12	985	-4180
37.50	9	133	133	92	-860	-12	860	-4180
35.00	8	157	157	92	-736	-12	736	-4180
33.00	8	174	174	92	-637	-12	637	-4179
33.00	8	174	174	34	162	-13	163	-4179
30.00	8	165	165	34	312	-13	313	-4179
27.50	7	154	154	34	436	-13	436	-4179
25.00	7	139	139	34	560	-13	560	-4179
22.50	7	120	120	34	684	-12	684	-4179
20.00	6	98	98	34	808	-12	809	-4179
20.00	6	98	98	-24	1608	-12	1608	-4180
17.50	6	48	48	-24	1733	-12	1733	-4180
15.00	5	-6	8	-24	1858	-12	1858	-4180
12.50	5	-64	64	-24	1983	-12	1983	-4180
10.00	5	-125	125	-24	2108	-12	2108	-4180
7.00	4	-204	204	-24	2259	-12	2260	-4180
7.00	4	-204	204	-81	3061	-13	3061	-4179
5.00	4	-278	278	-81	3161	-13	3161	-4179
2.50	3	-375	375	-81	3288	-13	3288	-4178
0.00	3	-476	476	-81	3416	-14	3416	-4176

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	3	93	93	81	-1040	14	1040	-4916
37.50	3	123	123	81	-915	13	916	-4916
35.00	4	148	148	81	-791	13	792	-4916
33.00	4	166	166	81	-691	13	692	-4916
33.00	4	166	166	24	107	13	108	-4915
30.00	5	159	160	24	257	13	258	-4915
27.50	5	150	150	24	381	13	381	-4915
25.00	5	137	137	24	505	13	505	-4915
22.50	6	120	120	24	629	13	629	-4915
20.00	6	99	99	24	753	13	753	-4916
20.00	6	99	99	-34	1552	13	1552	-4916
17.50	7	50	51	-34	1677	14	1677	-4916
15.00	7	-2	7	-34	1802	13	1802	-4916
12.50	7	-58	58	-34	1928	13	1928	-4916
10.00	8	-117	118	-34	2053	13	2053	-4916
7.00	8	-194	194	-34	2204	13	2204	-4916
7.00	8	-194	194	-92	3005	13	3005	-4915
5.00	8	-267	267	-92	3108	12	3108	-4914
2.50	9	-362	363	-92	3236	11	3236	-4912
0.00	9	-461	461	-92	3361	11	3361	-4912

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	4	52	52	21	-1120	-1	1120	-588
37.50	4	84	84	21	-995	-1	995	-588
35.00	4	112	112	21	-870	-1	870	-588
33.00	4	132	132	21	-770	-1	770	-588
33.00	4	132	132	10	-70	-1	70	-587
30.00	4	131	131	10	80	-1	80	-587
27.50	4	127	127	10	205	-1	205	-587
25.00	4	119	119	10	330	-1	330	-587
22.50	4	107	107	10	455	-1	455	-587
20.00	4	92	92	10	580	-1	580	-588
20.00	4	92	92	-1	1280	-2	1280	-588
17.50	3	52	52	-1	1405	-2	1405	-588
15.00	3	8	8	-1	1530	-2	1530	-588
12.50	3	-40	40	-1	1655	-2	1655	-588
10.00	3	-92	92	-1	1780	-2	1780	-588
7.00	3	-158	159	-1	1930	-2	1930	-588
7.00	3	-158	159	-12	2630	-2	2630	-588
5.00	3	-223	223	-12	2730	-2	2730	-588
2.50	3	-307	307	-12	2856	-2	2856	-587
0.00	3	-394	394	-12	2981	-3	2981	-585

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	3	53	53	12	-1125	2	1125	-1511
37.50	3	85	85	12	-1000	2	1000	-1511
35.00	3	113	113	12	-875	2	875	-1511
33.00	3	133	133	12	-775	2	775	-1511
33.00	3	133	133	1	-76	2	76	-1510
30.00	3	133	133	1	74	2	74	-1510
27.50	3	129	129	1	199	2	199	-1510
25.00	3	121	121	1	324	2	324	-1510
22.50	3	109	109	1	449	2	449	-1510
20.00	4	94	94	1	574	2	574	-1510
20.00	4	94	94	-10	1273	1	1273	-1511
17.50	4	54	54	-10	1398	1	1398	-1511
15.00	4	10	11	-10	1523	1	1523	-1511
12.50	4	-38	38	-10	1648	1	1648	-1511
10.00	4	-89	89	-10	1774	1	1774	-1511
7.00	4	-156	156	-10	1924	1	1924	-1511
7.00	4	-156	156	-21	2624	1	2624	-1510
5.00	4	-220	220	-21	2725	1	2725	-1510
2.50	4	-303	303	-21	2850	0	2850	-1510
0.00	4	-391	391	-21	2976	0	2976	-1508

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	1.0	0.5	1.2	0.0	0.00	0.09	0.00	0.08	0.17	65.00	99.90
60.00	0.9	0.4	1.0	0.0	0.42	0.11	0.00	0.08	0.53	65.00	99.90
55.00	0.8	0.4	0.9	0.0	0.76	0.12	0.00	0.08	0.88	65.00	73.98
50.00	0.6	0.3	0.7	0.0	1.04	0.13	0.00	0.07	1.16	65.00	55.91
48.00	0.6	0.3	0.7	0.0	1.13	0.13	0.00	0.07	1.26	65.00	51.55
48.00	0.6	0.3	0.7	0.0	0.76	0.09	0.00	0.05	0.85	65.00	76.30
45.00	0.5	0.3	0.6	0.0	0.85	0.10	0.00	0.05	0.94	65.00	68.79
45.00	0.5	0.3	0.6	0.0	2.93	0.35	0.14	0.32	3.31	65.00	19.67
40.00	0.4	0.2	0.5	0.0	2.05	0.35	0.13	0.30	2.43	65.00	26.77
35.00	0.3	0.2	0.4	0.0	1.31	0.35	0.12	0.29	1.73	65.00	37.59
32.00	0.3	0.1	0.3	0.0	1.08	0.35	0.11	0.28	1.50	65.00	43.32
32.00	0.3	0.1	0.3	0.0	0.60	0.38	0.11	0.24	0.99	65.00	65.57
30.00	0.3	0.1	0.3	0.0	0.79	0.38	0.10	0.24	1.17	65.00	55.47
30.00	0.3	0.1	0.3	0.0	0.79	0.39	0.10	0.24	1.18	65.00	55.21
25.00	0.2	0.1	0.2	0.0	1.19	0.39	0.10	0.22	1.58	65.00	41.14
21.25	0.1	0.1	0.2	0.0	1.45	0.39	0.09	0.21	1.84	65.00	35.30
21.25	0.1	0.1	0.2	0.0	1.30	0.42	0.09	0.28	1.72	65.00	37.78
20.00	0.1	0.1	0.1	0.0	1.43	0.42	0.08	0.28	1.85	65.00	35.05
15.00	0.1	0.0	0.1	0.0	1.96	0.42	0.08	0.27	2.38	65.00	27.28
10.00	0.0	0.0	0.0	0.0	2.45	0.42	0.07	0.26	2.88	65.00	22.59
5.00	0.0	0.0	0.0	0.0	2.87	0.43	0.07	0.24	3.30	65.00	19.68
0.00	0.0	0.0	0.0	0.0	3.24	0.43	0.06	0.23	3.67	65.00	17.73

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.9	0.6	1.1	0.0	0.00	0.09	0.00	0.08	0.17	65.00	99.90
60.00	0.8	0.6	1.0	0.0	0.42	0.11	0.00	0.08	0.53	65.00	99.90
55.00	0.7	0.5	0.8	0.0	0.76	0.12	0.00	0.08	0.88	65.00	74.06
50.00	0.6	0.4	0.7	0.0	1.03	0.13	0.00	0.07	1.16	65.00	55.98
48.00	0.6	0.4	0.7	0.0	1.13	0.13	0.00	0.07	1.26	65.00	51.62
48.00	0.6	0.4	0.7	0.0	0.76	0.09	0.00	0.05	0.85	65.00	76.40
45.00	0.5	0.3	0.6	0.0	0.85	0.10	0.00	0.05	0.94	65.00	68.89
45.00	0.5	0.3	0.6	0.0	2.05	0.70	0.00	0.40	2.77	65.00	23.43
40.00	0.4	0.3	0.5	0.0	0.65	0.69	0.00	0.38	1.50	65.00	43.43
35.00	0.4	0.2	0.4	0.0	1.55	0.68	0.00	0.37	2.25	65.00	28.92
32.00	0.3	0.2	0.4	0.0	2.24	0.67	0.00	0.36	2.92	65.00	22.26
32.00	0.3	0.2	0.4	0.0	0.46	0.79	0.00	0.32	1.37	65.00	47.38
30.00	0.3	0.2	0.3	0.0	0.64	0.79	0.00	0.31	1.49	65.00	43.48
30.00	0.3	0.2	0.3	0.0	0.64	0.79	0.00	0.31	1.50	65.00	43.33
25.00	0.2	0.1	0.2	0.0	1.61	0.78	0.00	0.30	2.40	65.00	27.09
21.25	0.1	0.1	0.2	0.0	2.32	0.77	0.00	0.29	3.08	65.00	21.08
21.25	0.1	0.1	0.2	0.0	1.14	0.87	0.00	0.25	2.02	65.00	32.25
20.00	0.1	0.1	0.2	0.0	1.32	0.87	0.00	0.24	2.20	65.00	29.61
15.00	0.1	0.0	0.1	0.0	1.99	0.85	0.00	0.23	2.85	65.00	22.83
10.00	0.0	0.0	0.0	0.0	2.56	0.84	0.00	0.23	3.40	65.00	19.09
5.00	0.0	0.0	0.0	0.0	3.07	0.83	0.00	0.22	3.90	65.00	16.67
0.00	0.0	0.0	0.0	0.0	3.55	0.82	0.00	0.21	4.37	65.00	14.89

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.8	0.5	0.9	0.0	0.00	0.09	0.00	0.08	0.17	65.00	99.90
60.00	0.7	0.4	0.8	0.0	0.42	0.11	0.00	0.08	0.53	65.00	99.90
55.00	0.6	0.4	0.7	0.0	0.76	0.12	0.00	0.08	0.88	65.00	74.13
50.00	0.6	0.3	0.7	0.0	1.03	0.13	0.00	0.07	1.16	65.00	56.03
48.00	0.6	0.3	0.6	0.0	1.13	0.13	0.00	0.07	1.26	65.00	51.67
48.00	0.6	0.3	0.6	0.0	0.76	0.09	0.00	0.05	0.85	65.00	76.48
45.00	0.5	0.3	0.6	0.0	0.85	0.10	0.00	0.05	0.94	65.00	68.96
45.00	0.5	0.3	0.6	0.0	4.23	0.43	0.14	0.71	4.69	65.00	13.85
40.00	0.4	0.2	0.5	0.0	1.64	0.42	0.13	0.67	2.14	65.00	30.41
35.00	0.4	0.2	0.4	0.0	1.02	0.42	0.12	0.64	1.66	65.00	39.07
32.00	0.3	0.1	0.3	0.0	2.09	0.42	0.11	0.62	2.53	65.00	25.67
32.00	0.3	0.1	0.3	0.0	0.50	0.52	0.11	0.38	1.19	65.00	54.52
30.00	0.3	0.1	0.3	0.0	0.78	0.52	0.10	0.38	1.37	65.00	47.40
30.00	0.3	0.1	0.3	0.0	0.78	0.52	0.10	0.38	1.38	65.00	47.22
25.00	0.2	0.1	0.2	0.0	1.63	0.52	0.10	0.36	2.15	65.00	30.20
21.25	0.2	0.1	0.2	0.0	2.24	0.52	0.09	0.34	2.77	65.00	23.49
21.25	0.2	0.1	0.2	0.0	1.14	0.59	0.09	0.31	1.77	65.00	36.69
20.00	0.1	0.1	0.1	0.0	1.30	0.59	0.08	0.31	1.92	65.00	33.86
15.00	0.1	0.0	0.1	0.0	1.87	0.59	0.08	0.29	2.46	65.00	26.39
10.00	0.0	0.0	0.0	0.0	2.45	0.58	0.07	0.28	3.04	65.00	21.41
5.00	0.0	0.0	0.0	0.0	2.95	0.58	0.07	0.27	3.53	65.00	18.42
0.00	0.0	0.0	0.0	0.0	3.37	0.58	0.06	0.26	3.95	65.00	16.44

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
Design Id: Item_36
Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	0.3	0.6	0.0	8.38	0.21	0.05	1.24	8.61	65.00	7.55
37.50	0.5	0.3	0.6	0.1	4.53	0.21	0.05	1.22	4.77	65.00	13.63
35.00	0.5	0.3	0.6	0.1	0.73	0.21	0.05	1.20	2.09	65.00	31.04
33.00	0.5	0.3	0.6	0.2	2.27	0.21	0.05	1.19	2.57	65.00	25.26
33.00	0.5	0.3	0.6	0.2	2.27	0.33	0.05	0.39	2.61	65.00	24.88
30.00	0.5	0.4	0.6	0.3	3.58	0.33	0.05	0.37	3.91	65.00	16.61
27.50	0.5	0.4	0.6	0.3	4.60	0.33	0.05	0.35	4.94	65.00	13.16
25.00	0.5	0.4	0.6	0.3	5.57	0.33	0.05	0.34	5.91	65.00	11.00
22.50	0.5	0.3	0.6	0.4	6.49	0.33	0.05	0.32	6.82	65.00	9.53
20.00	0.5	0.3	0.6	0.4	7.34	0.33	0.05	0.30	7.68	65.00	8.47
20.00	0.5	0.3	0.6	0.4	7.34	0.45	0.05	0.60	7.79	65.00	8.34
17.50	0.5	0.3	0.6	0.3	5.54	0.45	0.05	0.61	5.99	65.00	10.85
15.00	0.5	0.3	0.6	0.3	3.68	0.45	0.05	0.63	4.13	65.00	15.75
12.50	0.5	0.3	0.6	0.2	1.76	0.44	0.05	0.65	2.21	65.00	29.35
10.00	0.5	0.3	0.6	0.2	0.41	0.44	0.05	0.67	1.22	65.00	53.16
7.00	0.5	0.3	0.6	0.1	2.73	0.44	0.05	0.69	3.20	65.00	20.34
7.00	0.5	0.3	0.6	0.1	2.73	0.56	0.05	1.49	3.45	65.00	18.86
5.00	0.5	0.3	0.6	0.0	6.42	0.56	0.05	1.50	7.03	65.00	9.24
2.50	0.5	0.3	0.6	0.0	11.16	0.56	0.05	1.51	11.76	65.00	5.53
0.00	0.5	0.3	0.6	0.0	15.96	0.56	0.05	1.53	16.54	65.00	3.93

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.5	0.3	0.6	0.0	6.90	0.23	0.05	1.18	7.16	65.00	9.07
37.50	0.5	0.3	0.6	0.1	3.22	0.23	0.05	1.16	3.51	65.00	18.53
35.00	0.5	0.3	0.6	0.2	0.58	0.23	0.05	1.15	2.05	65.00	31.65
33.00	0.5	0.3	0.6	0.2	3.28	0.23	0.05	1.13	3.58	65.00	18.15
33.00	0.5	0.3	0.6	0.2	3.28	0.35	0.05	0.34	3.63	65.00	17.92
30.00	0.5	0.3	0.6	0.3	4.38	0.35	0.05	0.32	4.73	65.00	13.73
27.50	0.5	0.3	0.6	0.3	5.24	0.35	0.05	0.30	5.59	65.00	11.63
25.00	0.5	0.3	0.6	0.4	6.04	0.35	0.05	0.28	6.39	65.00	10.17
22.50	0.5	0.3	0.6	0.4	6.79	0.35	0.05	0.26	7.14	65.00	9.11
20.00	0.5	0.3	0.6	0.4	7.48	0.35	0.05	0.25	7.83	65.00	8.30
20.00	0.5	0.3	0.6	0.4	7.48	0.46	0.05	0.65	7.95	65.00	8.17
17.50	0.5	0.3	0.6	0.3	5.50	0.46	0.05	0.67	5.98	65.00	10.86
15.00	0.5	0.4	0.6	0.3	3.47	0.46	0.05	0.69	3.96	65.00	16.41
12.50	0.5	0.4	0.6	0.2	1.38	0.46	0.05	0.71	1.90	65.00	34.13
10.00	0.5	0.4	0.6	0.1	1.02	0.46	0.05	0.72	1.64	65.00	39.52
7.00	0.5	0.3	0.6	0.1	3.56	0.46	0.05	0.75	4.07	65.00	15.97
7.00	0.5	0.3	0.6	0.1	3.56	0.58	0.05	1.54	4.32	65.00	15.04
5.00	0.5	0.3	0.6	0.0	7.30	0.58	0.05	1.55	7.92	65.00	8.21
2.50	0.5	0.3	0.6	0.0	12.21	0.58	0.05	1.57	12.82	65.00	5.07
0.00	0.5	0.3	0.6	0.0	17.18	0.58	0.05	1.59	17.77	65.00	3.66

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.2	0.4	0.0	1.61	0.28	0.70	0.84	2.21	65.00	29.47
37.50	0.3	0.2	0.4	0.0	2.01	0.28	0.70	0.82	2.56	65.00	25.39
35.00	0.3	0.2	0.4	0.1	2.36	0.28	0.70	0.80	2.88	65.00	22.55
33.00	0.3	0.2	0.4	0.1	2.60	0.28	0.70	0.79	3.11	65.00	20.92
33.00	0.3	0.2	0.4	0.1	2.60	0.28	0.26	0.28	2.92	65.00	22.24
30.00	0.3	0.2	0.4	0.1	2.47	0.28	0.26	0.30	2.80	65.00	23.23
27.50	0.3	0.2	0.4	0.1	2.31	0.28	0.26	0.32	2.64	65.00	24.66
25.00	0.3	0.2	0.4	0.1	2.08	0.28	0.26	0.34	2.42	65.00	26.85
22.50	0.3	0.2	0.4	0.1	1.81	0.28	0.26	0.36	2.15	65.00	30.18
20.00	0.3	0.2	0.4	0.1	1.48	0.28	0.26	0.37	1.84	65.00	35.39
20.00	0.3	0.2	0.4	0.1	1.48	0.28	0.18	0.41	1.77	65.00	36.74
17.50	0.3	0.2	0.3	0.1	0.74	0.28	0.18	0.42	1.07	65.00	61.03
15.00	0.3	0.2	0.3	0.0	0.12	0.28	0.18	0.44	0.79	65.00	82.21
12.50	0.3	0.2	0.3	0.0	0.97	0.28	0.18	0.46	1.29	65.00	50.47
10.00	0.3	0.2	0.3	0.0	1.87	0.28	0.18	0.48	2.15	65.00	30.18
7.00	0.3	0.2	0.3	0.0	3.02	0.28	0.18	0.50	3.30	65.00	19.67
7.00	0.3	0.2	0.3	0.0	3.02	0.28	0.62	1.05	3.52	65.00	18.44
5.00	0.3	0.1	0.3	0.0	4.11	0.28	0.62	1.06	4.56	65.00	14.25
2.50	0.3	0.1	0.3	0.0	5.53	0.28	0.62	1.08	5.94	65.00	10.95
0.00	0.3	0.1	0.3	0.0	7.01	0.28	0.62	1.10	7.39	65.00	8.80

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.3	0.1	0.3	0.0	1.39	0.33	0.62	0.77	2.06	65.00	31.58
37.50	0.3	0.1	0.3	0.0	1.82	0.33	0.62	0.75	2.42	65.00	26.90
35.00	0.3	0.1	0.3	0.1	2.20	0.33	0.62	0.73	2.75	65.00	23.68
33.00	0.3	0.2	0.3	0.1	2.47	0.33	0.62	0.72	2.98	65.00	21.82
33.00	0.3	0.2	0.3	0.1	2.47	0.33	0.18	0.20	2.82	65.00	23.06
30.00	0.3	0.2	0.3	0.1	2.37	0.33	0.18	0.22	2.73	65.00	23.83
27.50	0.3	0.2	0.3	0.1	2.23	0.33	0.18	0.23	2.59	65.00	25.08
25.00	0.3	0.2	0.3	0.1	2.04	0.33	0.18	0.25	2.40	65.00	27.05
22.50	0.3	0.2	0.3	0.1	1.79	0.33	0.18	0.27	2.16	65.00	30.08
20.00	0.3	0.2	0.3	0.1	1.49	0.33	0.18	0.29	1.87	65.00	34.82
20.00	0.3	0.2	0.3	0.1	1.49	0.33	0.26	0.48	1.85	65.00	35.12
17.50	0.3	0.2	0.3	0.1	0.78	0.33	0.26	0.49	1.20	65.00	54.20
15.00	0.3	0.2	0.3	0.0	0.11	0.33	0.26	0.51	0.92	65.00	70.91
12.50	0.3	0.2	0.4	0.0	0.89	0.33	0.26	0.53	1.30	65.00	49.98
10.00	0.3	0.2	0.4	0.0	1.77	0.33	0.26	0.55	2.12	65.00	30.62
7.00	0.3	0.2	0.4	0.0	2.90	0.33	0.26	0.57	3.24	65.00	20.03
7.00	0.3	0.2	0.4	0.0	2.90	0.33	0.70	1.12	3.47	65.00	18.71
5.00	0.3	0.2	0.4	0.0	3.98	0.33	0.70	1.14	4.47	65.00	14.53
2.50	0.3	0.2	0.4	0.0	5.38	0.33	0.70	1.15	5.81	65.00	11.19
0.00	0.3	0.2	0.4	0.0	6.84	0.33	0.70	1.17	7.23	65.00	8.99

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.1	0.2	0.0	0.79	0.04	0.16	0.31	0.87	65.00	74.66
37.50	0.1	0.1	0.2	0.0	1.26	0.04	0.16	0.30	1.31	65.00	49.63
35.00	0.1	0.1	0.2	0.1	1.67	0.04	0.16	0.28	1.72	65.00	37.81
33.00	0.1	0.1	0.2	0.1	1.96	0.04	0.16	0.27	2.01	65.00	32.38
33.00	0.1	0.1	0.2	0.1	1.96	0.04	0.08	0.09	2.00	65.00	32.48
30.00	0.1	0.1	0.2	0.1	1.95	0.04	0.08	0.09	2.00	65.00	32.51
27.50	0.1	0.1	0.2	0.1	1.89	0.04	0.08	0.10	1.94	65.00	33.55
25.00	0.1	0.1	0.2	0.1	1.77	0.04	0.08	0.12	1.82	65.00	35.71
22.50	0.1	0.1	0.2	0.1	1.60	0.04	0.08	0.14	1.65	65.00	39.41
20.00	0.1	0.1	0.2	0.1	1.37	0.04	0.08	0.16	1.42	65.00	45.66
20.00	0.1	0.1	0.2	0.1	1.37	0.04	0.01	0.19	1.42	65.00	45.91
17.50	0.1	0.1	0.2	0.1	0.78	0.04	0.01	0.20	0.83	65.00	78.52
15.00	0.1	0.1	0.2	0.0	0.13	0.04	0.01	0.22	0.38	65.00	99.90
12.50	0.1	0.1	0.2	0.0	0.61	0.04	0.01	0.24	0.67	65.00	97.61
10.00	0.1	0.1	0.2	0.0	1.37	0.04	0.01	0.26	1.42	65.00	45.90
7.00	0.1	0.1	0.2	0.0	2.35	0.04	0.01	0.28	2.40	65.00	27.14
7.00	0.1	0.1	0.2	0.0	2.35	0.04	0.09	0.46	2.39	65.00	27.19
5.00	0.1	0.1	0.2	0.0	3.29	0.04	0.09	0.47	3.34	65.00	19.48
2.50	0.2	0.1	0.2	0.0	4.53	0.04	0.09	0.49	4.57	65.00	14.23
0.00	0.2	0.1	0.2	0.0	5.81	0.04	0.09	0.51	5.85	65.00	11.10

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.1	0.2	0.0	0.79	0.10	0.09	0.25	0.90	65.00	72.25
37.50	0.1	0.1	0.2	0.0	1.26	0.10	0.09	0.23	1.37	65.00	47.50
35.00	0.1	0.1	0.2	0.1	1.68	0.10	0.09	0.21	1.78	65.00	36.47
33.00	0.1	0.1	0.2	0.1	1.97	0.10	0.09	0.20	2.07	65.00	31.34
33.00	0.1	0.1	0.2	0.1	1.97	0.10	0.01	0.02	2.07	65.00	31.37
30.00	0.1	0.1	0.2	0.1	1.97	0.10	0.01	0.02	2.07	65.00	31.36
27.50	0.1	0.1	0.2	0.1	1.91	0.10	0.01	0.04	2.01	65.00	32.29
25.00	0.1	0.1	0.2	0.1	1.80	0.10	0.01	0.05	1.90	65.00	34.24
22.50	0.1	0.1	0.2	0.1	1.63	0.10	0.01	0.07	1.73	65.00	37.60
20.00	0.1	0.1	0.2	0.1	1.40	0.10	0.01	0.09	1.50	65.00	43.21
20.00	0.1	0.1	0.2	0.1	1.40	0.10	0.08	0.25	1.50	65.00	43.25
17.50	0.1	0.1	0.2	0.1	0.81	0.10	0.08	0.27	0.91	65.00	71.11
15.00	0.1	0.1	0.2	0.0	0.17	0.10	0.08	0.29	0.50	65.00	99.90
12.50	0.1	0.1	0.2	0.0	0.58	0.10	0.08	0.31	0.69	65.00	93.56
10.00	0.1	0.1	0.2	0.0	1.33	0.10	0.08	0.32	1.43	65.00	45.32
7.00	0.1	0.1	0.2	0.0	2.31	0.10	0.08	0.34	2.41	65.00	26.94
7.00	0.1	0.1	0.2	0.0	2.31	0.10	0.16	0.53	2.42	65.00	26.83
5.00	0.1	0.1	0.2	0.0	3.25	0.10	0.16	0.54	3.36	65.00	19.37
2.50	0.1	0.1	0.2	0.0	4.48	0.10	0.16	0.56	4.59	65.00	14.18
0.00	0.1	0.1	0.2	0.0	5.77	0.10	0.16	0.57	5.87	65.00	11.07

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Left in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	201	600	633	133
60.00	36	-12	38	0	201	602	635	439
55.00	72	-24	76	0	202	604	637	762
50.00	109	-36	114	0	202	606	638	1101
48.00	123	-41	130	0	202	606	639	1242
48.00	123	-41	130	0	202	606	639	1242
45.00	145	-48	153	0	202	608	641	1564
45.00	194	62	203	389	722	5404	5452	1183
40.00	518	19	518	389	722	5407	5455	1740
35.00	842	-24	843	389	719	5409	5457	2326
32.00	1037	-50	1038	389	720	5411	5459	2687
32.00	994	-120	1001	383	-60	5564	5565	4426
30.00	1128	-119	1134	383	-60	5565	5566	4672
30.00	1128	-119	1134	383	-61	5564	5565	4874
25.00	1462	-115	1466	383	-62	5564	5564	5510
21.25	1712	-112	1716	383	-62	5565	5566	6002
21.25	1728	-193	1739	365	990	5588	5676	7689
20.00	1812	-208	1824	365	989	5586	5673	7858
15.00	2147	-267	2164	365	988	5581	5668	8546
10.00	2482	-327	2504	365	987	5576	5662	9259
5.00	2817	-386	2843	365	985	5569	5655	9997
0.00	3151	-445	3182	365	985	5569	5656	10757

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Center in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	200	601	633	132
60.00	36	-12	38	0	200	603	636	438
55.00	72	-24	76	0	200	606	638	761
50.00	109	-36	115	0	201	608	640	1100
48.00	123	-41	130	0	201	609	641	1241
48.00	123	-41	130	0	201	609	641	1241
45.00	145	-48	153	0	201	611	643	1563
45.00	48	173	180	0	2346	9019	9319	1682
40.00	590	32	590	0	2346	9023	9323	2243
35.00	1131	-108	1136	0	2346	9025	9325	2829
32.00	1456	-193	1469	0	2347	9027	9327	3191
32.00	1197	22	1197	0	2086	8766	9010	7627
30.00	1407	-28	1407	0	2086	8767	9012	7873
30.00	1407	-28	1407	0	2086	8764	9009	8077
25.00	1933	-153	1939	0	2086	8761	9006	8717
21.25	2327	-247	2340	0	2086	8764	9009	9208
21.25	2230	-78	2231	-1	1734	8739	8909	13334
20.00	2361	-104	2363	-1	1734	8732	8902	13506
15.00	2885	-208	2892	-1	1733	8720	8891	14198
10.00	3408	-312	3422	-1	1732	8707	8877	14916
5.00	3931	-415	3952	-1	1730	8691	8861	15660
0.00	4452	-519	4482	-1	1730	8691	8862	16419

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Right in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
65.00	0	0	0	0	199	601	633	133
60.00	36	-12	38	0	199	603	635	439
55.00	72	-24	76	0	199	605	637	762
50.00	109	-36	114	0	199	606	638	1101
48.00	123	-41	130	0	200	607	639	1242
48.00	123	-41	130	0	200	607	639	1242
45.00	145	-48	153	0	200	609	641	1564
45.00	194	69	206	-389	1735	5408	5679	2117
40.00	518	-35	519	-389	1737	5409	5681	2676
35.00	843	-140	854	-389	1739	5411	5683	3260
32.00	1038	-202	1057	-389	1739	5412	5685	3622
32.00	994	84	998	-384	2784	5565	6223	6257
30.00	1128	17	1128	-384	2784	5567	6224	6503
30.00	1128	17	1128	-384	2785	5564	6222	6705
25.00	1462	-150	1470	-384	2786	5562	6221	7341
21.25	1712	-276	1734	-384	2786	5564	6222	7832
21.25	1729	-23	1729	-365	2087	5586	5963	10230
20.00	1812	-55	1813	-365	2088	5582	5959	10400
15.00	2147	-180	2155	-365	2088	5575	5953	11087
10.00	2482	-305	2501	-365	2088	5567	5946	11800
5.00	2816	-431	2849	-365	2087	5558	5937	12539
0.00	3149	-556	3198	-365	2087	5558	5937	13298

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 1 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-246	113	271	49	408	4204	4223	-557
37.50	-120	98	155	49	532	4203	4236	-558
35.00	6	81	81	49	657	4202	4253	-558
33.00	107	64	124	49	757	4201	4269	-558
33.00	107	64	124	49	136	1206	1213	143
30.00	150	56	160	49	286	1205	1238	143
27.50	186	46	192	49	411	1204	1272	143
25.00	222	31	224	49	536	1203	1317	144
22.50	258	13	259	49	661	1202	1372	144
20.00	294	-8	294	49	786	1201	1436	145
20.00	294	-8	294	49	167	-1796	1804	840
17.50	240	-15	241	49	292	-1797	1820	840
15.00	187	-26	188	49	418	-1798	1846	839
12.50	133	-40	139	49	543	-1799	1879	839
10.00	79	-58	98	49	668	-1800	1920	838
7.00	14	-85	86	49	818	-1801	1978	838
7.00	14	-85	86	49	201	-4799	4803	1530
5.00	-101	-91	136	49	301	-4800	4809	1530
2.50	-245	-102	266	49	427	-4799	4818	1533
0.00	-389	-117	406	49	552	-4800	4832	1533

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 2 (Cond BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	-389	111	404	-49	382	4796	4811	-522
37.50	-245	98	264	-49	507	4795	4822	-522
35.00	-101	80	129	-49	633	4794	4836	-524
33.00	14	64	66	-49	733	4794	4850	-525
33.00	14	64	66	-49	117	1799	1803	183
30.00	79	57	97	-49	267	1798	1818	184
27.50	133	47	141	-49	392	1797	1840	184
25.00	187	34	190	-49	517	1796	1870	184
22.50	240	16	241	-49	643	1796	1907	185
20.00	294	-5	294	-49	768	1795	1952	185
20.00	294	-5	294	-49	149	-1201	1210	890
17.50	258	-11	258	-49	274	-1202	1233	889
15.00	222	-21	223	-49	399	-1203	1267	889
12.50	186	-35	189	-49	524	-1204	1313	889
10.00	150	-53	159	-49	649	-1205	1369	888
7.00	107	-79	133	-49	799	-1206	1447	888
7.00	107	-79	133	-49	178	-4203	4206	1587
5.00	6	-84	85	-49	278	-4203	4213	1587
2.50	-120	-95	153	-49	402	-4204	4223	1588
0.00	-247	-109	269	-49	527	-4205	4238	1588

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 3 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	75	-78	108	130	-1768	-131	1773	1042
37.50	71	-27	76	130	-1643	-132	1649	1042
35.00	67	20	70	130	-1518	-134	1524	1042
33.00	63	56	84	130	-1418	-134	1425	1042
33.00	63	56	84	72	-618	-139	633	1043
30.00	58	75	95	72	-468	-140	488	1043
27.50	54	87	103	72	-343	-140	370	1043
25.00	50	96	108	72	-217	-141	259	1043
22.50	46	100	110	72	-92	-142	169	1043
20.00	41	101	109	72	33	-142	146	1043
20.00	41	101	109	14	833	-146	846	1043
17.50	37	74	83	14	958	-147	970	1043
15.00	33	44	55	14	1084	-147	1094	1043
12.50	28	9	30	14	1209	-148	1218	1042
10.00	24	-29	37	14	1334	-148	1342	1042
7.00	18	-79	82	14	1484	-149	1491	1042
7.00	18	-79	81	-43	2284	-152	2289	1042
5.00	15	-135	136	-43	2384	-153	2389	1043
2.50	10	-209	209	-43	2508	-154	2513	1044
0.00	6	-286	286	-43	2633	-154	2638	1044

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 4 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	6	-70	70	43	-1737	154	1744	779
37.50	10	-20	22	43	-1612	153	1619	779
35.00	15	26	30	43	-1487	153	1495	779
33.00	19	61	64	43	-1387	152	1395	779
33.00	19	61	64	-14	-587	149	606	780
30.00	24	79	83	-14	-437	148	461	780
27.50	28	91	95	-14	-312	147	345	780
25.00	33	98	103	-14	-186	147	237	780
22.50	37	102	108	-14	-61	146	159	780
20.00	42	102	110	-14	64	146	159	780
20.00	42	102	110	-72	864	142	876	780
17.50	46	74	87	-72	989	142	999	780
15.00	50	42	66	-72	1114	141	1123	780
12.50	54	7	55	-72	1240	140	1247	780
10.00	58	-32	67	-72	1365	139	1372	780
7.00	63	-84	105	-72	1515	138	1521	779
7.00	63	-84	105	-130	2315	133	2319	779
5.00	67	-141	156	-130	2415	132	2418	780
2.50	70	-215	226	-130	2539	130	2543	781
0.00	74	-293	302	-130	2665	130	2668	781

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 5 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	27	-87	91	49	-1706	-11	1706	-700
37.50	27	-38	46	49	-1581	-11	1581	-700
35.00	27	8	28	49	-1455	-12	1456	-700
33.00	26	42	49	49	-1355	-12	1355	-700
33.00	26	42	49	38	-655	-15	656	-700
30.00	26	63	68	38	-505	-16	506	-700
27.50	25	76	80	38	-380	-16	381	-700
25.00	25	85	89	38	-255	-17	256	-700
22.50	24	91	94	38	-130	-17	132	-700
20.00	24	93	96	38	-5	-18	19	-700
20.00	24	93	96	27	695	-20	695	-700
17.50	23	70	74	27	820	-21	820	-700
15.00	22	44	49	27	945	-21	945	-700
12.50	22	14	26	27	1070	-21	1070	-700
10.00	21	-20	29	27	1195	-22	1195	-700
7.00	20	-66	69	27	1345	-22	1345	-700
7.00	20	-66	69	16	2045	-24	2045	-700
5.00	20	-116	118	16	2145	-25	2145	-700
2.50	19	-182	183	16	2270	-25	2270	-700
0.00	18	-252	253	16	2396	-25	2396	-699

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Forces and Moments for Arm 6 (Equip BM) in the Local Element Coordinate System

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
40.00	18	-81	83	-16	-1685	25	1685	-1053
37.50	19	-33	38	-16	-1560	25	1560	-1053
35.00	20	12	23	-16	-1435	24	1435	-1053
33.00	20	46	50	-16	-1335	24	1335	-1053
33.00	20	46	50	-27	-635	22	635	-1053
30.00	21	66	69	-27	-485	21	485	-1053
27.50	22	78	81	-27	-360	21	360	-1053
25.00	22	87	90	-27	-235	21	236	-1052
22.50	23	92	95	-27	-110	20	112	-1052
20.00	24	94	97	-27	15	20	25	-1052
20.00	24	94	97	-38	715	17	715	-1053
17.50	24	71	75	-38	840	17	840	-1053
15.00	25	44	50	-38	965	16	965	-1053
12.50	25	13	28	-38	1090	16	1090	-1053
10.00	26	-22	34	-38	1215	15	1215	-1053
7.00	26	-68	73	-38	1365	15	1365	-1053
7.00	26	-68	73	-49	2065	12	2065	-1053
5.00	27	-119	122	-49	2166	11	2166	-1053
2.50	27	-186	188	-49	2291	11	2291	-1053
0.00	27	-257	258	-49	2416	10	2416	-1052

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Left

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.3	3.1	3.1	0.0	0.00	0.01	0.00	0.07	0.13	65.00	99.90
60.00	0.3	2.7	2.7	0.0	0.37	0.02	0.00	0.07	0.39	65.00	99.90
55.00	0.3	2.4	2.4	0.0	0.66	0.04	0.00	0.07	0.70	65.00	93.04
50.00	0.2	2.0	2.1	0.0	0.90	0.05	0.00	0.06	0.95	65.00	68.39
48.00	0.2	1.9	1.9	0.0	0.98	0.06	0.00	0.06	1.04	65.00	62.63
48.00	0.2	1.9	1.9	0.0	0.66	0.04	0.00	0.04	0.70	65.00	92.64
45.00	0.2	1.7	1.7	0.0	0.74	0.05	0.00	0.04	0.79	65.00	82.80
45.00	0.2	1.7	1.7	0.0	0.98	0.04	0.92	1.26	2.24	65.00	29.04
40.00	0.2	1.4	1.4	0.0	2.23	0.05	0.84	1.16	2.74	65.00	23.73
35.00	0.1	1.1	1.1	0.0	3.31	0.07	0.77	1.08	3.65	65.00	17.79
32.00	0.1	0.9	0.9	0.0	3.89	0.07	0.73	1.03	4.19	65.00	15.53
32.00	0.1	0.9	0.9	0.0	3.80	0.12	0.72	1.03	4.17	65.00	15.60
30.00	0.1	0.8	0.8	0.0	4.16	0.13	0.70	1.00	4.49	65.00	14.47
30.00	0.1	0.8	0.8	0.0	4.16	0.13	0.70	1.00	4.50	65.00	14.45
25.00	0.1	0.6	0.6	0.0	4.94	0.15	0.64	0.94	5.24	65.00	12.41
21.25	0.1	0.4	0.4	0.0	5.44	0.15	0.61	0.89	5.72	65.00	11.37
21.25	0.1	0.4	0.4	0.0	5.56	0.20	0.58	0.87	5.85	65.00	11.11
20.00	0.1	0.4	0.4	0.0	5.72	0.20	0.57	0.86	6.01	65.00	10.81
15.00	0.0	0.2	0.2	0.0	6.31	0.21	0.53	0.80	6.59	65.00	9.86
10.00	0.0	0.1	0.1	0.0	6.80	0.22	0.49	0.76	7.08	65.00	9.18
5.00	0.0	0.0	0.0	0.0	7.22	0.23	0.46	0.72	7.49	65.00	8.68
0.00	0.0	0.0	0.0	0.0	7.56	0.24	0.43	0.68	7.83	65.00	8.30

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36
Deflections and Stresses for Center

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.3	4.1	4.1	0.0	0.00	0.01	0.00	0.07	0.13	65.00	99.90
60.00	0.3	3.6	3.7	0.0	0.37	0.02	0.00	0.07	0.39	65.00	99.90
55.00	0.3	3.2	3.2	0.0	0.66	0.04	0.00	0.07	0.70	65.00	92.93
50.00	0.2	2.8	2.8	0.0	0.90	0.05	0.00	0.06	0.95	65.00	68.28
48.00	0.2	2.6	2.6	0.0	0.98	0.06	0.00	0.06	1.04	65.00	62.52
48.00	0.2	2.6	2.6	0.0	0.66	0.04	0.00	0.04	0.70	65.00	92.48
45.00	0.2	2.3	2.3	0.0	0.74	0.05	0.00	0.04	0.79	65.00	82.64
45.00	0.2	2.3	2.3	0.0	0.87	0.05	0.00	0.59	1.37	65.00	47.32
40.00	0.2	1.9	1.9	0.0	2.55	0.07	0.00	0.56	2.66	65.00	24.47
35.00	0.1	1.5	1.5	0.0	4.52	0.08	0.00	0.54	4.60	65.00	14.12
32.00	0.1	1.3	1.3	0.0	5.59	0.09	0.00	0.53	5.68	65.00	11.45
32.00	0.1	1.3	1.3	0.0	4.46	0.21	0.00	0.51	4.69	65.00	13.86
30.00	0.1	1.1	1.1	0.0	5.07	0.22	0.00	0.50	5.29	65.00	12.29
30.00	0.1	1.1	1.1	0.0	5.07	0.22	0.00	0.50	5.30	65.00	12.28
25.00	0.1	0.8	0.8	0.0	6.53	0.23	0.00	0.48	6.76	65.00	9.61
21.25	0.1	0.6	0.6	0.0	7.47	0.24	0.00	0.47	7.71	65.00	8.43
21.25	0.1	0.6	0.6	0.0	7.03	0.34	0.00	0.46	7.37	65.00	8.82
20.00	0.1	0.5	0.5	0.0	7.32	0.34	0.00	0.46	7.66	65.00	8.48
15.00	0.0	0.3	0.3	0.0	8.36	0.35	0.00	0.44	8.71	65.00	7.46
10.00	0.0	0.1	0.1	0.0	9.25	0.35	0.00	0.42	9.60	65.00	6.77
5.00	0.0	0.0	0.0	0.0	9.99	0.36	0.00	0.41	10.34	65.00	6.28
0.00	0.0	0.0	0.0	0.0	10.61	0.36	0.00	0.39	10.97	65.00	5.92

BY VALMONT INDUSTRIES FOR:
 Design Id: Item_36
 Deflections and Stresses for Right

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
65.00	0.3	3.1	3.1	0.0	0.00	0.01	0.00	0.07	0.13	65.00	99.90
60.00	0.3	2.7	2.7	0.0	0.37	0.02	0.00	0.07	0.39	65.00	99.90
55.00	0.3	2.4	2.4	0.0	0.66	0.04	0.00	0.07	0.70	65.00	93.02
50.00	0.2	2.0	2.0	0.0	0.90	0.05	0.00	0.06	0.95	65.00	68.37
48.00	0.2	1.9	1.9	0.0	0.98	0.06	0.00	0.06	1.04	65.00	62.61
48.00	0.2	1.9	1.9	0.0	0.66	0.04	0.00	0.04	0.70	65.00	92.62
45.00	0.2	1.7	1.7	0.0	0.74	0.05	0.00	0.04	0.79	65.00	82.78
45.00	0.2	1.7	1.7	0.0	0.99	0.07	0.92	1.27	2.35	65.00	27.71
40.00	0.2	1.4	1.4	0.0	2.25	0.08	0.84	1.18	2.86	65.00	22.73
35.00	0.1	1.1	1.1	0.0	3.43	0.09	0.77	1.10	3.78	65.00	17.21
32.00	0.1	0.9	0.9	0.0	4.05	0.10	0.73	1.05	4.34	65.00	14.96
32.00	0.1	0.9	0.9	0.0	3.77	0.17	0.72	1.07	4.28	65.00	15.20
30.00	0.1	0.8	0.8	0.0	4.06	0.18	0.70	1.04	4.53	65.00	14.34
30.00	0.1	0.8	0.8	0.0	4.06	0.18	0.70	1.04	4.54	65.00	14.32
25.00	0.1	0.6	0.6	0.0	4.97	0.19	0.64	0.97	5.31	65.00	12.24
21.25	0.1	0.4	0.4	0.0	5.58	0.20	0.61	0.93	5.89	65.00	11.03
21.25	0.1	0.4	0.4	0.0	5.42	0.26	0.58	0.88	5.79	65.00	11.22
20.00	0.1	0.4	0.4	0.0	5.60	0.26	0.57	0.87	5.95	65.00	10.92
15.00	0.0	0.2	0.2	0.0	6.25	0.27	0.53	0.82	6.59	65.00	9.87
10.00	0.0	0.1	0.1	0.0	6.79	0.28	0.49	0.77	7.12	65.00	9.12
5.00	0.0	0.0	0.0	0.0	7.24	0.29	0.46	0.73	7.58	65.00	8.58
0.00	0.0	0.0	0.0	0.0	7.62	0.29	0.43	0.69	7.96	65.00	8.17

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 1 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	2.3	2.3	0.0	4.31	0.04	0.37	0.96	4.45	65.00	14.62
37.50	0.2	2.3	2.3	0.0	2.37	0.04	0.37	0.96	2.70	65.00	24.12
35.00	0.2	2.3	2.3	0.0	1.22	0.04	0.37	0.96	2.08	65.00	31.24
33.00	0.2	2.3	2.4	0.0	1.95	0.04	0.37	0.97	2.34	65.00	27.73
33.00	0.2	2.3	2.4	0.0	1.95	0.01	0.37	0.54	2.10	65.00	30.99
30.00	0.2	2.4	2.4	0.0	2.55	0.01	0.37	0.54	2.67	65.00	24.39
27.50	0.2	2.3	2.4	0.0	3.01	0.01	0.37	0.55	3.12	65.00	20.83
25.00	0.2	2.3	2.3	0.0	3.46	0.01	0.37	0.56	3.56	65.00	18.27
22.50	0.2	2.3	2.3	0.0	3.88	0.01	0.37	0.56	3.97	65.00	16.36
20.00	0.2	2.3	2.3	0.0	4.38	0.01	0.37	0.57	4.42	65.00	14.69
20.00	0.2	2.3	2.3	0.0	4.38	0.06	0.37	0.62	4.46	65.00	14.59
17.50	0.2	2.2	2.2	0.0	3.63	0.06	0.37	0.63	3.71	65.00	17.53
15.00	0.2	2.2	2.2	0.0	2.90	0.06	0.37	0.63	2.98	65.00	21.80
12.50	0.2	2.1	2.1	0.0	2.19	0.06	0.37	0.63	2.33	65.00	27.89
10.00	0.2	2.0	2.0	0.0	1.51	0.06	0.37	0.64	1.74	65.00	37.32
7.00	0.2	1.9	1.9	0.0	1.34	0.06	0.37	0.65	1.70	65.00	38.24
7.00	0.2	1.9	1.9	0.0	1.34	0.10	0.37	1.04	2.15	65.00	30.24
5.00	0.2	1.9	1.9	0.0	2.04	0.10	0.37	1.04	2.50	65.00	25.95
2.50	0.2	1.8	1.8	0.0	4.23	0.10	0.37	1.04	4.34	65.00	14.97
0.00	0.2	1.7	1.7	0.0	6.43	0.10	0.37	1.04	6.55	65.00	9.93

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 2 (Cond BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.2	1.7	1.7	0.0	6.39	0.04	0.37	1.04	6.43	65.00	10.10
37.50	0.2	1.8	1.8	0.0	4.19	0.04	0.37	1.04	4.27	65.00	15.22
35.00	0.2	1.9	1.9	0.0	1.98	0.04	0.37	1.05	2.42	65.00	26.88
33.00	0.2	1.9	1.9	0.0	1.03	0.04	0.37	1.05	2.05	65.00	31.73
33.00	0.2	1.9	1.9	0.0	1.03	0.01	0.37	0.62	1.48	65.00	43.87
30.00	0.2	2.0	2.0	0.0	1.50	0.01	0.37	0.63	1.75	65.00	37.16
27.50	0.2	2.1	2.1	0.0	2.24	0.01	0.37	0.63	2.42	65.00	26.83
25.00	0.2	2.2	2.2	0.0	2.95	0.01	0.37	0.63	3.10	65.00	20.96
22.50	0.2	2.2	2.2	0.0	3.63	0.01	0.37	0.64	3.77	65.00	17.25
20.00	0.2	2.3	2.3	0.0	4.36	0.01	0.37	0.64	4.42	65.00	14.71
20.00	0.2	2.3	2.3	0.0	4.36	0.06	0.37	0.54	4.49	65.00	14.49
17.50	0.2	2.3	2.3	0.0	3.87	0.06	0.37	0.54	4.01	65.00	16.21
15.00	0.2	2.3	2.3	0.0	3.40	0.06	0.37	0.55	3.56	65.00	18.27
12.50	0.2	2.3	2.4	0.0	2.95	0.06	0.37	0.56	3.13	65.00	20.74
10.00	0.2	2.4	2.4	0.0	2.53	0.06	0.37	0.56	2.74	65.00	23.73
7.00	0.2	2.3	2.4	0.0	2.05	0.06	0.37	0.57	2.30	65.00	28.20
7.00	0.2	2.3	2.4	0.0	2.05	0.11	0.37	0.96	2.50	65.00	26.04
5.00	0.2	2.3	2.3	0.0	1.28	0.11	0.37	0.96	2.15	65.00	30.29
2.50	0.2	2.3	2.3	0.0	2.35	0.11	0.37	0.96	2.72	65.00	23.94
0.00	0.2	2.3	2.3	0.0	4.29	0.11	0.37	0.96	4.49	65.00	14.48

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 3 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	1.3	1.3	0.0	1.60	0.07	0.99	1.24	2.67	65.00	24.36
37.50	0.1	1.3	1.3	0.0	1.20	0.07	0.99	1.22	2.43	65.00	26.70
35.00	0.1	1.3	1.3	0.0	1.10	0.07	0.99	1.21	2.38	65.00	27.30
33.00	0.1	1.2	1.3	0.1	1.27	0.07	0.99	1.19	2.45	65.00	26.54
33.00	0.1	1.2	1.3	0.1	1.27	0.07	0.55	0.64	1.74	65.00	37.37
30.00	0.1	1.2	1.2	0.1	1.46	0.07	0.55	0.62	1.85	65.00	35.21
27.50	0.1	1.2	1.2	0.1	1.61	0.07	0.55	0.60	1.97	65.00	33.01
25.00	0.1	1.2	1.2	0.1	1.71	0.07	0.55	0.59	2.05	65.00	31.74
22.50	0.1	1.2	1.2	0.1	1.75	0.07	0.55	0.58	2.08	65.00	31.26
20.00	0.1	1.2	1.2	0.1	1.74	0.07	0.55	0.57	2.06	65.00	31.51
20.00	0.1	1.2	1.2	0.1	1.74	0.07	0.11	0.23	1.82	65.00	35.74
17.50	0.1	1.1	1.1	0.1	1.32	0.07	0.11	0.25	1.40	65.00	46.50
15.00	0.1	1.1	1.1	0.1	0.84	0.07	0.11	0.26	0.92	65.00	70.46
12.50	0.1	1.1	1.1	0.0	0.47	0.07	0.11	0.28	0.60	65.00	99.90
10.00	0.1	1.0	1.1	0.0	0.57	0.07	0.11	0.30	0.68	65.00	96.01
7.00	0.1	1.0	1.0	0.0	1.28	0.07	0.11	0.32	1.35	65.00	48.12
7.00	0.1	1.0	1.0	0.0	1.28	0.07	0.33	0.65	1.58	65.00	41.19
5.00	0.1	1.0	1.0	0.0	2.08	0.07	0.33	0.66	2.30	65.00	28.21
2.50	0.1	1.0	1.0	0.0	3.13	0.07	0.33	0.68	3.31	65.00	19.64
0.00	0.1	0.9	0.9	0.0	4.24	0.07	0.33	0.70	4.39	65.00	14.81

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 4 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.9	0.9	0.0	1.07	0.05	0.33	0.57	1.36	65.00	47.88
37.50	0.1	1.0	1.0	0.0	0.36	0.05	0.33	0.56	1.00	65.00	64.96
35.00	0.1	1.0	1.0	0.0	0.48	0.05	0.33	0.54	0.99	65.00	65.68
33.00	0.1	1.0	1.0	0.1	1.01	0.05	0.33	0.52	1.25	65.00	51.83
33.00	0.1	1.0	1.0	0.1	1.01	0.05	0.11	0.20	1.08	65.00	60.45
30.00	0.1	1.0	1.1	0.1	1.31	0.05	0.11	0.17	1.38	65.00	47.19
27.50	0.1	1.1	1.1	0.1	1.50	0.05	0.11	0.16	1.57	65.00	41.42
25.00	0.1	1.1	1.1	0.1	1.64	0.05	0.11	0.14	1.71	65.00	38.09
22.50	0.1	1.1	1.1	0.1	1.72	0.05	0.11	0.13	1.79	65.00	36.34
20.00	0.1	1.2	1.2	0.1	1.75	0.05	0.11	0.13	1.82	65.00	35.80
20.00	0.1	1.2	1.2	0.1	1.75	0.05	0.55	0.67	2.09	65.00	31.05
17.50	0.1	1.2	1.2	0.1	1.36	0.05	0.55	0.69	1.78	65.00	36.48
15.00	0.1	1.2	1.2	0.1	0.99	0.05	0.55	0.71	1.60	65.00	40.50
12.50	0.1	1.2	1.2	0.0	0.84	0.05	0.55	0.73	1.53	65.00	42.42
10.00	0.1	1.2	1.2	0.0	1.05	0.05	0.55	0.74	1.67	65.00	38.98
7.00	0.1	1.2	1.3	0.0	1.62	0.05	0.55	0.76	1.98	65.00	32.78
7.00	0.1	1.2	1.3	0.0	1.62	0.05	0.99	1.32	2.68	65.00	24.25
5.00	0.1	1.3	1.3	0.0	2.47	0.05	0.99	1.33	3.17	65.00	20.51
2.50	0.1	1.3	1.3	0.0	3.59	0.05	0.99	1.35	4.12	65.00	15.78
0.00	0.1	1.3	1.3	0.0	4.76	0.05	0.99	1.37	5.19	65.00	12.53

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 5 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.6	0.6	0.0	1.44	0.05	0.37	0.61	1.61	65.00	40.36
37.50	0.1	0.6	0.6	0.0	0.72	0.05	0.37	0.59	1.15	65.00	56.35
35.00	0.1	0.6	0.6	0.0	0.44	0.05	0.37	0.58	1.06	65.00	61.40
33.00	0.1	0.6	0.6	0.0	0.77	0.05	0.37	0.56	1.12	65.00	58.04
33.00	0.1	0.6	0.6	0.0	0.77	0.05	0.29	0.38	0.93	65.00	69.90
30.00	0.1	0.6	0.6	0.1	1.08	0.05	0.29	0.36	1.21	65.00	53.66
27.50	0.1	0.6	0.6	0.1	1.27	0.05	0.29	0.34	1.40	65.00	46.59
25.00	0.1	0.6	0.6	0.1	1.41	0.05	0.29	0.33	1.53	65.00	42.52
22.50	0.1	0.5	0.6	0.1	1.49	0.05	0.29	0.31	1.61	65.00	40.37
20.00	0.1	0.5	0.5	0.1	1.51	0.05	0.29	0.29	1.64	65.00	39.65
20.00	0.1	0.5	0.5	0.1	1.51	0.05	0.21	0.30	1.62	65.00	40.20
17.50	0.1	0.5	0.5	0.1	1.18	0.05	0.21	0.32	1.30	65.00	50.10
15.00	0.1	0.5	0.5	0.1	0.78	0.05	0.21	0.34	0.94	65.00	69.05
12.50	0.1	0.5	0.5	0.0	0.40	0.05	0.21	0.36	0.75	65.00	86.89
10.00	0.1	0.5	0.5	0.0	0.43	0.05	0.21	0.37	0.79	65.00	82.15
7.00	0.1	0.5	0.5	0.0	1.09	0.05	0.21	0.40	1.24	65.00	52.40
7.00	0.1	0.5	0.5	0.0	1.09	0.05	0.12	0.41	1.21	65.00	53.65
5.00	0.1	0.5	0.5	0.0	1.83	0.05	0.12	0.42	1.92	65.00	33.82
2.50	0.1	0.4	0.4	0.0	2.80	0.05	0.12	0.44	2.88	65.00	22.59
0.00	0.1	0.4	0.4	0.0	3.82	0.05	0.12	0.46	3.89	65.00	16.69

BY VALMONT INDUSTRIES FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459
 Design Id: Item_36
 Deflections and Stresses for Arm 6 (Equip BM)

DATE 01/02/2019
 IMPAX 21.2.5.0

Loading Case 6 Construction

*** Deflections and Stresses ***

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Applied Bending Stress (ksi)	Applied Axial Stress (ksi)	Applied Torsion Stress (ksi)	Applied Shear Stress (ksi)	Applied Combined Stress (ksi)	Allowable Stress (ksi)	Allowable Divided by Combined
40.00	0.1	0.4	0.4	0.0	1.31	0.07	0.12	0.36	1.43	65.00	45.52
37.50	0.1	0.4	0.4	0.0	0.59	0.07	0.12	0.34	0.79	65.00	82.36
35.00	0.1	0.5	0.5	0.0	0.37	0.07	0.12	0.32	0.69	65.00	94.16
33.00	0.1	0.5	0.5	0.0	0.79	0.07	0.12	0.31	0.93	65.00	70.02
33.00	0.1	0.5	0.5	0.0	0.79	0.07	0.21	0.30	0.96	65.00	67.72
30.00	0.1	0.5	0.5	0.1	1.10	0.07	0.21	0.28	1.23	65.00	52.68
27.50	0.1	0.5	0.5	0.1	1.29	0.07	0.21	0.26	1.41	65.00	46.04
25.00	0.1	0.5	0.5	0.1	1.42	0.07	0.21	0.24	1.54	65.00	42.23
22.50	0.1	0.5	0.5	0.1	1.50	0.07	0.21	0.22	1.61	65.00	40.28
20.00	0.1	0.5	0.5	0.1	1.53	0.07	0.21	0.21	1.64	65.00	39.75
20.00	0.1	0.5	0.5	0.1	1.52	0.07	0.29	0.39	1.65	65.00	39.29
17.50	0.1	0.5	0.6	0.1	1.19	0.07	0.29	0.41	1.33	65.00	49.03
15.00	0.1	0.6	0.6	0.1	0.79	0.07	0.29	0.43	0.95	65.00	68.08
12.50	0.1	0.6	0.6	0.0	0.45	0.07	0.29	0.44	0.84	65.00	77.64
10.00	0.1	0.6	0.6	0.0	0.51	0.07	0.29	0.46	0.89	65.00	73.11
7.00	0.1	0.6	0.6	0.0	1.16	0.07	0.29	0.48	1.29	65.00	50.26
7.00	0.1	0.6	0.6	0.0	1.16	0.07	0.37	0.66	1.38	65.00	47.25
5.00	0.1	0.6	0.6	0.0	1.91	0.07	0.37	0.68	2.03	65.00	31.95
2.50	0.1	0.6	0.6	0.0	2.90	0.07	0.37	0.69	3.00	65.00	21.66
0.00	0.1	0.6	0.6	0.0	3.94	0.07	0.37	0.71	4.03	65.00	16.13

MINIMUM DEFLECTION RATIO // DEFLECTION LIMIT / DEFLECTION // IS

BY VALMONT INDUSTRIES
Design Id: Item_36

FOR: GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

DATE 01/02/2019
IMPAX 21.2.5.0

FLANGE ANALYSIS

FLANGE FOR THE A - B JOINT : CONTROLLING LOAD CASE BASED ON 50% OF POLE CAPACITY - Left, Center, and Right Poles

Input Data

Results

Applied Reactions

Resultant Moment = 4,455 in-kips
Torsion = 0 in-kips
Resultant Shear = 0 lbs
Axial = 0 lbs

Bolts

Number of Bolts = 12
Bolt Diameter = 1.00 in
Bolt Material = A325
Bolt Circle = 31.00 in

Bolts

Maximum Bolt Axial Force= 47,908 lbs
Maximum Bolt Shear = 263 lbs
Allowable Axial Stress = 85.00 ksi
Allowable Axial w/ Shear= 85.00 ksi
Allowable Shear Stress = 54.00 ksi
Minimum Safety Factor = 1.08
Shear Safety Factor = 99.00
Tension Safety Factor = 1.08
Combined Safety Factor = 1.08

Flange

Outside Diameter = 33.50 in
Thickness = 1.500 in
Yield Strength = 50 ksi
Tensile Strength = 65 ksi
Valmont Material Spec. = S-56

Flange

Weight = 248 lbs
Controlling Stress = Shear
Minimum Safety Factor = 1.78
Bending Safety Factor = 2.25
Shear Safety Factor = 1.78
Bearing Safety Factor = 428.08

Tube

No. of sides = 12
Design Diameter = 26.185 in
Detailed "A" Sect. Dia = 26.221 in
Detailed "B" Sect. Dia = 26.149 in
Thickness = 0.3750 in
Thickness for M. Cap. = 0.2500 in
Yield = 65 ksi

*** BOLT COORDINATES ***

BOLT NO.	X-COORD	Y-COORD		BOLT NO.	X-COORD	Y-COORD
1	15.50	0.00	*	2	13.42	7.75
3	7.75	13.42	*	4	0.00	15.50

BY VALMONT INDUSTRIES FOR:
Design Id: Item_36

GRAND RIVER DAM AUTHORITY, 161KV 2BAY H-FR (ITEM 36), 433459

Date: 01/02/2019
IMPAX 21.2.5.0

*** ANCHOR BOLT AND BASEPLATE DESIGN FOR Left, Center, and Right Poles ***

ANCHOR BOLTS GEOMETRY AND MATERIAL

Number of bolts	12
Diameter	2.25 in
Length	84 in
Anchor bolt to baseplate nuts pattern	Two nuts
Anchor bolts include washers	Yes
Steel Spec.	S23

Tensile Stress	100000 psi
Allowable Axial Stress	75000 psi
Allowable Bending Stress	75000 psi
Allowable Shear Stress	35000 psi
Gross Area	3.98 in ²
Stress Area	3.25 in ²

CAGE ASSEMBLY / BOLT PATTERN

Cage Weight	1580 lb
Shipped As	Assembled Welded
Projection Length	10.50 in
Bolt Pattern	Round multiple of 4
Max Bolt Circle	46.00 in

Template Diameter	52.00 in
Bolt-bolt spacing - Actual	11.90 in
Bolt-bolt spacing - Min.	6.00 in
Bolt to shaft face spacing - Actual	4.00 in
Bolt to shaft face spacing - Min.	3.25 in
Edge distance - Actual	3.00 in
Edge distance - Min.	3.00 in

Design Code Concrete	ASCE SEI 48-11
Concrete f'c	4000 psi
Maximum bolt tension	157836 lb
Actual Bond Stress	308 psi
Allowable bond stress	333 psi
Required embedment depth	67.071 in
Max. allowable leveling	2.500 in

ANALYSIS RESULTS

Design Code	ASCE/NESC
Governing Load Case	2-3
Safety Factor	1.15
Max. Axial Stress	50933 psi

POLE SHAFT

Pole Shape	Twelve
Diameter	38.00 in
Wall Thickness	0.37500 in
Pole Material	S22
Pole Yield	65000 psi

BASE PLATE

Governing Load Case	2-2
Base Plate Shape	Match pole
Drawing Number	POL6-98
Overall Length	52.00 in
Overall Width	52.00 in
Side Width	13.93 in
Top Width	13.93 in

Thickness	2.50000 in
Valmont Spec	S56
Other Spec	A572
Actual Weight	1110 lb

Critical Failure Mode	4
Total length of Fail Line	48.28 in
Effective Length	41.01 in
Total moment along fail line	1488709 in-lb
Bending Stress	34846 psi
Allowable Stress	50000 psi

Controlling Loads

Load Case	Axial force (lb)	Shear Force (lb)	Moment X (in-kip)	Moment Y (in-kip)	Moment Z (in-kip)	Component
2-3	33449	29131	15930	-1798	-1815	Bolts
2-2	46181	43879	22310	-1791	-10	Plate

Bolt Coordinates and Forces for Controlling Load Case

Bolt Number	X-Coord (in)	Y-Coord (in)	Axial force (lb)	Shear Force (lb)	Axial Stress (ksi)	Shear Stress (ksi)	Bending Stress (ksi)	Safety Factor	Loadcase Number
1	22.998	0.000	-14048	8934	-4.32	2.25	34.60	1.923	2-1
2	19.917	11.499	-70261	8556	-21.62	2.15	33.14	1.367	2-1
3	11.499	19.917	-108199	7745	-33.29	1.95	30.00	1.183	2-1
4	0.000	22.998	-118236	7473	-36.38	1.88	28.94	1.146	2-3
5	-11.499	19.917	-96253	8400	-29.62	2.11	32.53	1.205	2-3
6	-19.917	11.499	-49226	8918	-15.15	2.24	34.54	1.506	2-3
7	-22.998	0.000	10244	8965	3.15	2.25	34.72	1.976	2-3
8	-19.917	-11.499	66222	8535	20.38	2.15	33.06	1.401	2-3
9	-11.499	-19.917	103710	7679	31.91	1.93	29.74	1.215	2-3
10	0.000	-22.998	113584	7309	34.95	1.84	28.31	1.184	2-1
11	11.499	-19.917	92095	8270	28.34	2.08	32.03	1.240	2-1
12	19.917	-11.499	45378	8835	13.96	2.22	34.22	1.553	2-1

Note: positive axial force indicates tension, negative axial force indicates compression.

APPENDIX A

ENGINEERING DESIGN SKETCHES

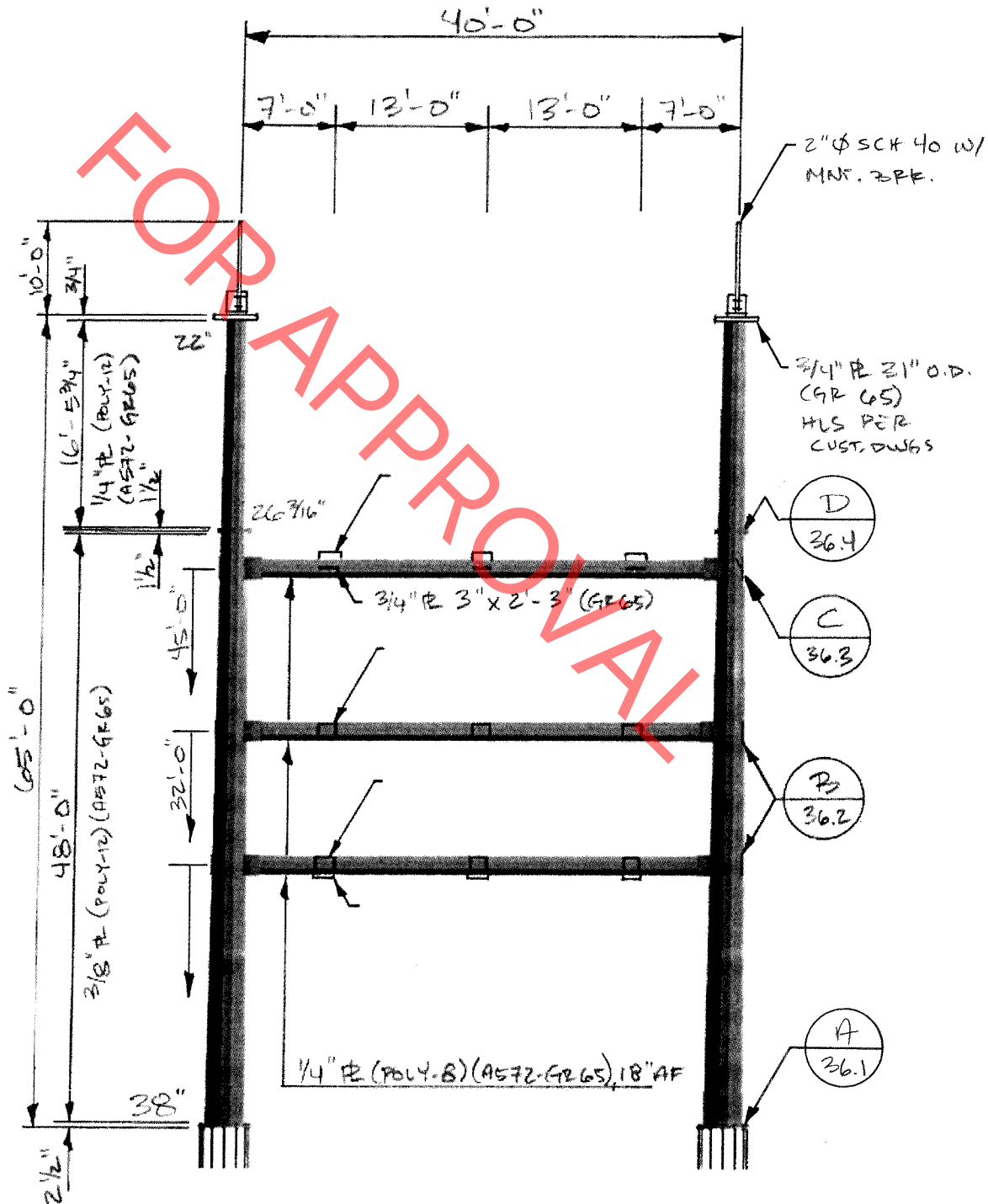


CHKD. BY _____ DATE _____

PROJECT NO. 433159

SHEET NO. 35.0

CUSTOMER GRAND RIVER DAM AUTHORITY





VALMONT

BY 805 DATE 01/02/2019

CHKD. BY _____ DATE _____

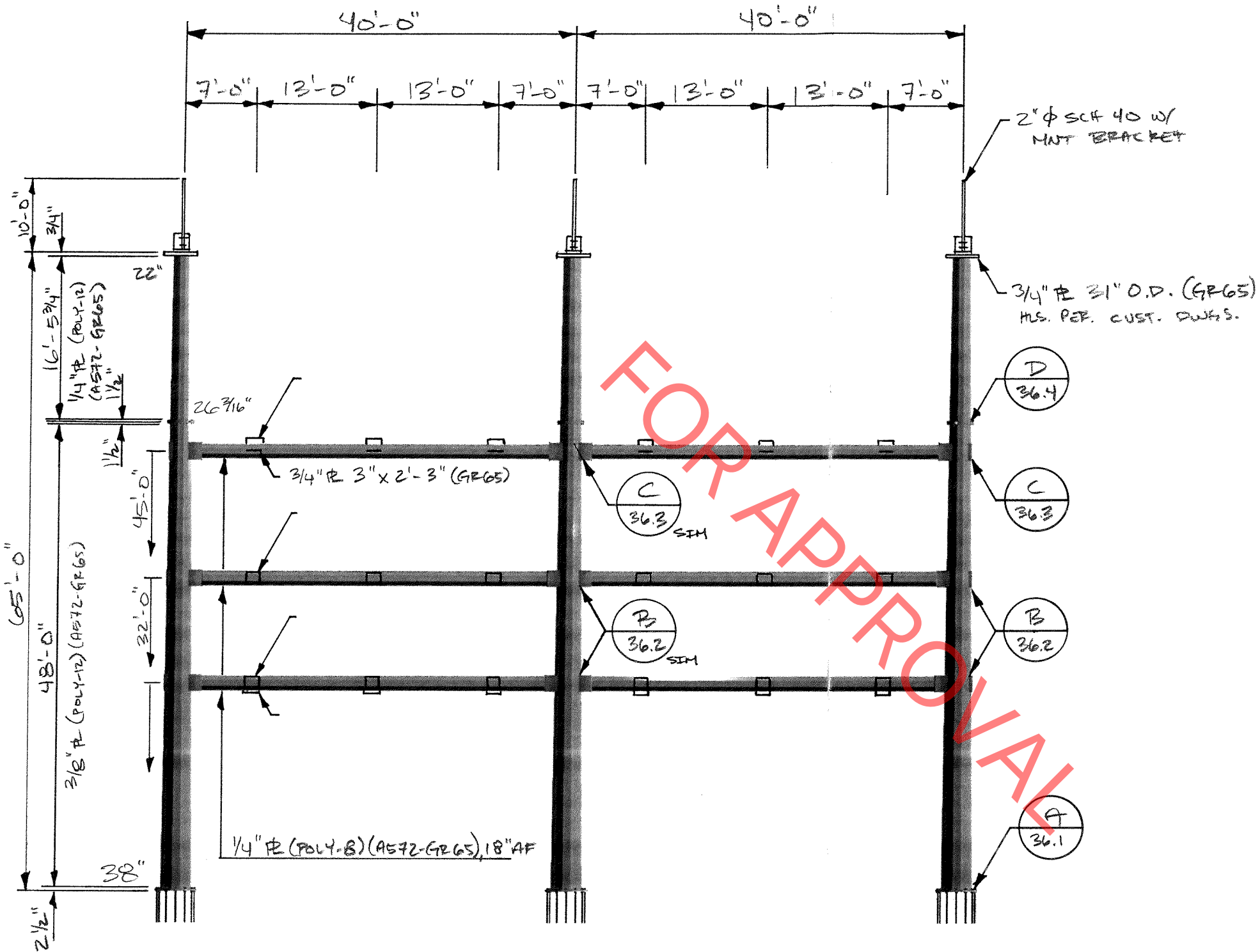
TELEPHONE (918) 583-5881
801 N. XANTHUS, TULSA, OKLAHOMA 74110

PROJECT NO. 433459

SHEET NO. 36.0

PROJECT 3500 MAIN SUBSTATION (5907) - (ITEM 36)

CUSTOMER GRAND RIVER DAM AUTHORITY



BY RO5
DATE 1/2/2019

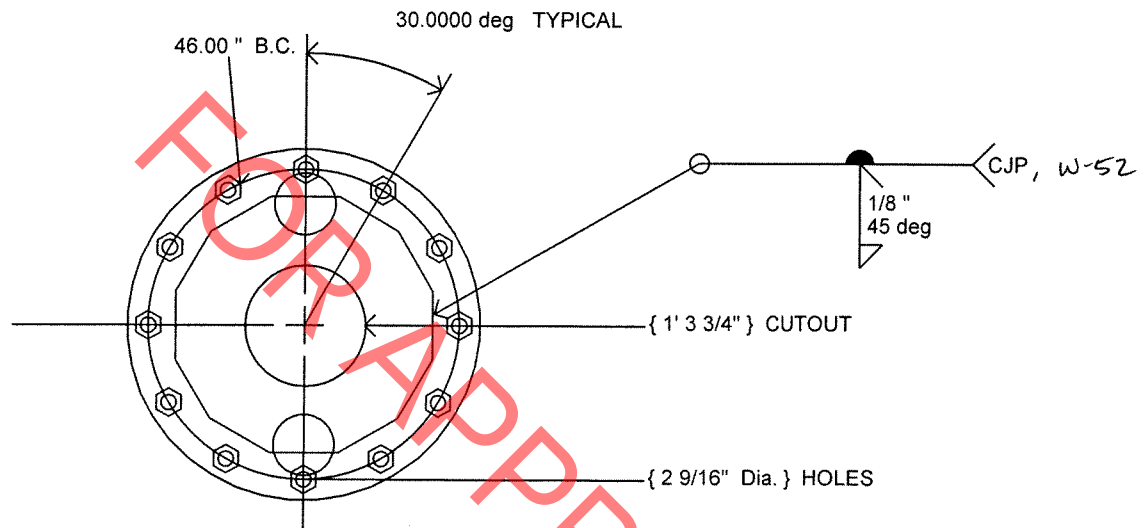
VALMONT - NEWMARK

JOB NO. 433459
SHEET NO. 36.1

CUSTOMER GRAND RIVER DAM AUTHORITY

PROJECT 3500 MAIN SUBSTATION (S907) - (ITEM 36)

CONN. TYPE BASE PLATE AND ANCHOR BOLTS



- (1) PL 2 1/2" X 4' 4" X 4' 4" (GR50)
- (12) 2 1/4" Dia. X 7' 0" (A615) (CAGED)
- (2 Nuts & 2 Washers)
- Projection Above Concrete: 10.5"

A BASE PLATE AND ANCHORS
36.1



B BENT-U BRACKET
36.2



BY #05 DATE 01/02/2019

CHKD. BY _____ DATE _____

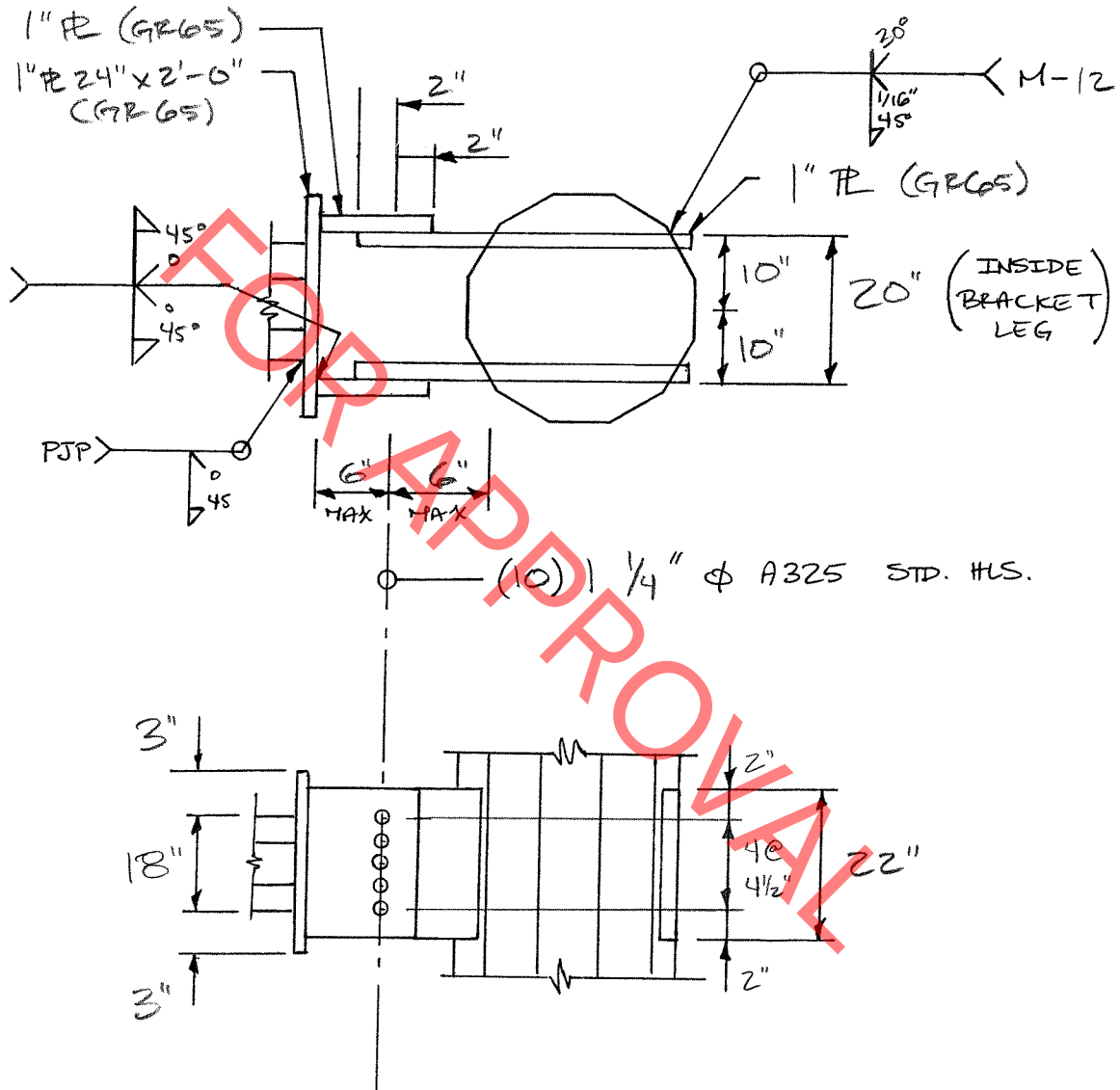
TELEPHONE (918) 583-5881
801 N. XANTHUS, TULSA, OKLAHOMA 74110

PROJECT NO. 433459

SHEET NO. 36.3

PROJECT 3500 MAIN SUBSTATION (S907) - (ITEM 36)

CUSTOMER GRAND RIVER DAM AUTHORITY



C 3-PIECE BRACKET
36.3

BY RO5
DATE 1/2/2019

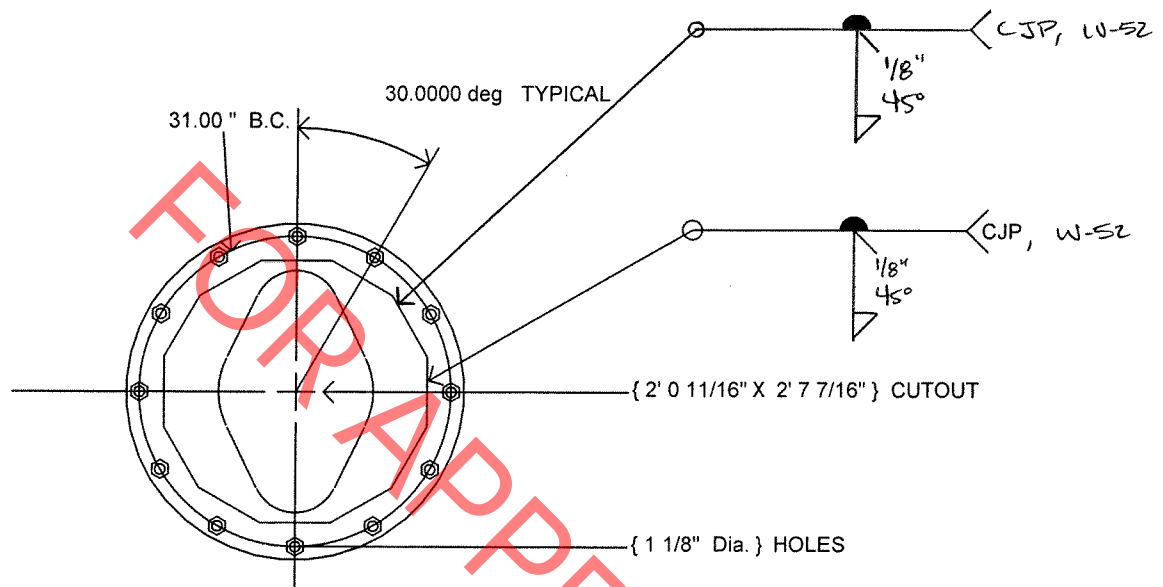
VALMONT - NEWMARK

JOB NO. 433459
SHEET NO. 36.4

CUSTOMER GRAND RIVER DAM AUTHORITY

PROJECT 3500 MAIN SUBSTATION (S907) - (ITEM 36)

CONN. TYPE FLANGE CONNECTION



- (2) PL 1 1/2" X 2' 9 1/2" X 2' 9 1/2" (GR50)
- (12) 1" Dia. X 4 1/4" (A325)
- (1 Nut & 0 Washers)

D FLANGE CONNECTION
36.4

FOR APPROVAL

APPENDIX B

CUSTOMER PROVIDED INFORMATION

GRAND RIVER DAM AUTHORITY



IGLOO VALLEY INTERCONNECT 345/161KV AND 3500 MAIN 161KV SWITCH STATION

Specifications – Substation Package – Part 2

Technical Specifications

GRAND RIVER DAM AUTHORITY

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GRAND RIVER DAM AUTHORITY

GENERAL SPECIFICATIONS

1.0 General

This section covers the general description, scope of the work, and supplementary requirements for equipment and materials included under these specifications.

The equipment and materials covered by these specifications will be incorporated in the GRDA's electric system.

The 3500 Main and Igloo Valley Station is located in the Mid America Industrial Park near Pryor, Oklahoma. The address of 3500 Main station is: 3270 Main MAIP St., Pryor, Oklahoma (GPS: Lat. 36.243308, Lon. -95.319192). The address for Igloo Valley Substation is: 5998 Armin Rd., Pryor, Oklahoma (GPS: Lat. 36.219269, Lon. -95.315850). These are the addresses for all shipments, unless specifically requested otherwise.

1.1 Work Included Under These Specifications

The work under these specifications shall include furnishing the following structures and equipment:

- Substation Steel Structures
- High Voltage Switches
- Insulators

Equipment, materials, and accessories furnished shall be delivered to substation sites where they will be received, unloaded, stored, and erected under separate specifications. Receiving, unloading, and storing shall not be construed as an acceptance of the work.

1.2 Site Meteorological and Seismic Data

Work shall be designed according to the following building code and site conditions:

General Design Data:	
Building Code	International Building Code 2000 (IBC 2000)
Site Elevation (Mean Sea Level), ft (m)	<2000 ft
Wind Design Data:	
Basic Wind Speed, V, Nominal 3 second gust wind speed at 33 ft (10 m) above ground for Exposure C category, mph (m/s)	100 mph

GRAND RIVER DAM AUTHORITY

Exposure Category	C
Topographic Factor, K_{zt}	1.0
Snow Design Data:	
Ground Snow Load, P_g , lb/ft ² (kN/m ²)	NA
Importance Factor (Snow Loads), I	NA
Ice Design Data:	
Nominal Ice Thickness, t , Due to freezing rain at a height of 33 ft (10 m), inches (mm)	1.00 in
Concurrent Wind Speed, V_c , mph (m/s)	40 mph
Seismic Design Data:	
Short Period Mapped Spectral Acceleration, S_s	Per ASCE 7, latest edition
One Second Period Mapped Spectral Acceleration, S_1	Per ASCE 7
Site Class	D
Importance Factor (Seismic Loads), I	1.25

Design Ambient Conditions

Area Specific Design: The general design ambient air conditions shall be used unless area specific or equipment specific conditions are indicated in the contract documents:

Area	Temperature, °F		Relative Humidity, %	
	Minimum	Maximum	Minimum	Maximum
General Outdoor Area	-12	120	0	100

1.3 Drawing Requirements

- Refer to individual equipment specifications for requirements.

1.4 Miscellaneous Materials and Services

Miscellaneous materials and services not otherwise specifically called for shall be furnished by the Contractor in accordance with the following:

- All nuts, bolts, gaskets, special fasteners, backing rings, etc., between components and equipment furnished under these specifications.

GRAND RIVER DAM AUTHORITY

- Erection drawings, prints, information, instructions, and other data for use by the Owner's erection contractor
- Testing of structural steel welding including visual, magnetic particle, and ultrasonic tests
- Testing of structural steel including Charpy and embrittlement tests
- All special tools or lifting lugs for off-loading

1.5 Work Not Included Under These Specifications

The following items of work will be furnished by the Owner unless otherwise stated in the PROPOSAL DOCUMENTS or the TECHNICAL SPECIFICATIONS.

- Unloading and field erection of all equipment
- Foundations
- Operating personnel for startup and tests

1.6 Submittal of Engineering Data

Drawings and other engineering data for the specified equipment and materials are essential to the design and subsequent construction of the entire project.

The Contractor will be required to submit drawings and engineering data in accordance with the schedule and requirements specified herein to assure compliance with the overall construction and operating schedule.

The Contractor shall allow for a reasonable amount of time for mailing, processing, and Owner's review of drawings and data in his Engineering Schedule and Procurement/Production/Shipping Schedule.

1.6.1 Drawings

Drawings shall be in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals.

Supplier shall fully complete and certify drawings for compliance with the Purchase Order requirements. Drawings shall have title block entries that clearly indicate the drawing is certified.

Each submitted drawing shall be project unique and shall be clearly marked with the name of the project, unit designation, GRDA's Purchase Order title, GRDA's Purchase Order file number, project equipment or structure nomenclature, component identification numbers, and GRDA's

GRAND RIVER DAM AUTHORITY

name. Equipment, instrumentation, and other components requiring GRDA-assigned identification tag numbers shall be clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project shall be clearly marked.

Transmittal letters shall identify which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter shall include the manufacturer's drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content. Transmittal letters for resubmitted drawings shall include the GRDA's drawing numbers.

Catalog pages are not acceptable, except as drawings for standard non-engineered products and when the catalog pages provide all dimensional data, all external termination data, and mounting data. The catalog page shall be submitted with a typed cover page clearly indicating the name of the project, unit designation, specification title, specification number, component identification numbers, model number, Supplier's drawing number, and GRDA's name.

Drawings shall be submitted with all numerical values in English as the primary units. Drawings with metric values only will not be accepted.

1.6.2 Drawing Submittal

Supplier shall use this form for all submittals.

Drawings shall be submitted electronically in AutoCAD version 2012 or later. MicroStation format files are not acceptable. If Supplier does not have the capability to provide AutoCAD version 2012 or later drawings, an alternative submittal format shall be used as mutually agreed between GRDA and Supplier. Technical data shall be submitted in native file format (Microsoft Word or Excel, other). Approval drawings may be submitted in .pdf format.

1.6.3 Drawing Processing

Supplier's engineering schedule shall allow a minimum of two (2) weeks for mailing, processing, and review of drawings and data by GRDA.

Unless this Purchase Order indicates that a drawing or engineering data submittal by Supplier is to be for GRDA's information only, GRDA, upon receipt of submittals, shall review and return same to Supplier, marked "Approved for Construction", "Approved as Corrected", or "Not-Approved, Correct and Resubmit". The timing of Supplier's submittals and GRDA's review shall be in accordance with the Completion Dates for same as set forth in the Purchase Order. The submittal of any drawing or other submittal document by Supplier to GRDA under this Purchase Order will be certification by Supplier that the information set forth therein is accurate in all material respects.

1.6.4 Approved for Construction

GRAND RIVER DAM AUTHORITY

Upon receipt of a submittal marked "Approved for Construction", Supplier may proceed with its Work to the extent of and in accordance with the submittal. Supplier shall not resubmit unless the drawing or document is revised, in which case it shall be resubmitted as a new document revision.

1.6.5 Approved as Corrected

Upon receipt of a submittal marked "Approved as Corrected" and if Supplier concurs with GRDA's comments, Supplier shall incorporate same and may proceed with its Work to the extent of and in accordance with the annotated submittal. Supplier shall submit to GRDA within fourteen calendar days a revision to the original submittal, in which GRDA's comments have been incorporated. If Supplier determines that it cannot incorporate GRDA's comments without prejudice to Supplier's warranty or other obligations under this Purchase Order, Supplier shall so advise GRDA in writing within seven calendar days of its receipt of GRDA's comments, stating the reasons therefore. Supplier may proceed with its Work to the extent of and in accordance with the annotated submittal only upon GRDA and Supplier resolving GRDA's comments.

1.6.6 Not-Approved, Correct and Resubmit

Upon receipt of a submittal marked "Not-Approved, Correct and Resubmit," Supplier shall immediately take all necessary action to revise its submittal in accordance with GRDA's comments, the Specification, and the Drawings, and shall resubmit to GRDA for review the corrected original submittal, voiding previous information and adding new documents if required. In no event shall Supplier proceed with the affected Work until its revised submittals have been returned to Supplier marked "Approved for Construction" or "Approved as Corrected" by GRDA.

1.6.7 Resubmittals

If during or subsequent to the completion of the submittal process, Supplier makes further changes to the equipment and materials shown on submittals that have been reviewed by GRDA, the changes shall be clearly marked on the submittal by Supplier and the submittal process shall be repeated. If changes are made by Supplier after delivery to the Jobsite, as-built drawings indicating the changes shall be prepared by Supplier and submitted to GRDA for review. Any resubmittal of information shall clearly identify the revisions by footnote or by a form of back-circle, with revision block update, as appropriate.

1.6.8 GRDA's Review

GRDA's review of drawings and other submittals will cover only general conformity of the data to the Specifications and Drawings, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions that affect plant arrangements. GRDA's review does not include a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted. Review and comment by GRDA of Supplier's Drawings or other submittals shall not relieve Supplier of its sole responsibility to meet the Completion Dates requirement of this Purchase Order and to supply Goods that conform to the requirements of this Purchase Order.

GRAND RIVER DAM AUTHORITY

1.6.9 File Returns to Supplier.

Electronic files of drawings will be returned to Supplier via e-mail.

1.7 Schedule

The time of completion of the work is a basic consideration of the contract. This shall include the completion of various activities in accordance with the milestone time periods and dates listed in addition to the timely delivery of the equipment and materials.

1.7.1 Activity Periods and Dates

The time periods and dates listed in the Schedule of Activities indicate the latest dates by which the listed activities shall be completed. Data, drawings, and lists for planning, engineering and documentation may be submitted earlier than the indicated dates at the Contractor's option.

1.7.2 Schedule of Activities

The Contractor shall provide equipment, materials, engineering data, labor, and services in accordance with the following:

GRAND RIVER DAM AUTHORITY

<u>Activity</u>	<u>Weeks After Receipt of Award</u>	
Contract Award	December 12, 2018	
Contractor to deliver schedule of engineering to the Engineer	4 weeks	
<u>Contractor to deliver drawings to Owner</u>	<u>Preliminary</u>	<u>Certified</u>
Structure Calculations	4 weeks	6 weeks
Equipment outlines, dimensions, and weights	4 weeks	6 weeks
Material List	6 weeks	10 weeks
Bus section and detail drawings	6 weeks	10 weeks
Steel structure fabrication drawings	6 weeks	10 weeks
Erection and anchor bolt layout drawings	6 weeks	10 weeks
Test report in electronic Microsoft Word file format		4 weeks before shipment
AutoCAD files of all final certified drawings		4 weeks before shipment
Contractor to deliver “proof copy” of instruction manuals to Owner	20 weeks	
Contractor to deliver five copies of accepted instruction manuals for each substation or facility as directed by the Owner	24 weeks	
<u>Contractor to deliver equipment to jobsite</u>		
Anchor bolts	8 weeks ARO	
Equipment Structures	20 weeks ARO	
Line “A” Frame Structures	20 weeks ARO	
Line “H” Frame Structures	20 weeks ARO	
Disconnect Switches	24 weeks ARO	
Insulators	24 weeks ARO	

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1.8 Shipment

The substation equipment shall be shipped to 3500 Main Station, 3270 Main MAIP St., Pryor, Oklahoma, and Igloo Valley Substation, 5998 Armin Rd., Pryor, Oklahoma after it has passed the tests and has been inspected for compliance to the specification.

The Contractor shall notify GRDA one week prior to shipment. Notification shall be to:

Nathan Ingram, Project Manager
Phone: 918-610-9729

Or

Dee Frost, Field Inspector Supt.
Phone: 918-557-7277

1.9 Documentation

Contractor will prepare engineering documents using AutoCAD® 2014 and Microsoft WORD. Electronic copies (two) of these documents will be made available on CD-ROM or e-mail.

Contractor shall submit two copies of each of the approval drawings.

All correspondence and drawing submittals **after award** shall be sent to GRDA:

The address for all correspondence and drawing submittals is:

Jeff Tullis, Chief Engineer
Grand River Dam Authority
9933 E. 16th Street
Tulsa, Oklahoma 74128
Email: jtullis@grda.com

Nathan Ingram, Project Manager
Grand River Dam Authority
9933 E. 16th Street
Tulsa, Oklahoma 74128
e-mail: ningram@grda.com
Office number: (918) 610-9729

GRAND RIVER DAM AUTHORITY

All correspondence **prior to award** shall be sent to GRDA:

Trudi Miles, Sr. Utility Contracting & Acquisitions
Grand River Dam Authority
Administration Headquarters
9933 E. 16th
Tulsa, Oklahoma 74128
Email: tmiles@grda.com
Office number: (918)610-9751

The contractor shall provide one (1) CD copy (in .pdf format) and one (1) paper copy of the instruction book. The book(s) shall be suitably bound in a 3 ring binder and furnished with an index. Catalog data sheets and renewal parts data need not be furnished and will not be accepted in lieu of the instruction book.

All drawings shall use GRDA title blocks and GRDA drawing numbers. These will be furnished upon award of the project.

All correspondence, documents, and shipments shall be labeled with the appropriate project name.

1.10 Approval

The Contractor shall comply with all requirements of this specification. Any exceptions taken by the Contractor shall be approved in writing by the Purchaser prior to fabrication.

All material, equipment, specifications, and drawings shall be approved by the Purchaser prior to shipment.

1.11 Warranty

All parts and material shall be new and free from defects or imperfections. All workmanship shall meet or exceed accepted construction practices, resulting in a neat and professionally finished appearance.

The Contractor shall be responsible for correcting any defects in material, equipment, and workmanship discovered within a minimum of one year after erection is completed. All Contractors' warranties for equipment shall be transferred in their entirety to the Purchaser.

1.12 Acceptance of Equipment

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After delivery, the equipment will be inspected by GRDA for visible damage, missing items, and signs of poor workmanship. Equipment or materials that are not acceptable shall be repaired, corrected, or replaced by the Fabricator at no additional cost to GRDA before the steel is accepted.

Acceptance does not occur until all equipment and documentation required by the specification and necessary to install the equipment is received by GRDA.

Acceptance of the equipment by GRDA does not relieve the Fabricator of the responsibility for the adequacy of materials and proper operation of equipment.

1.13 Terms of Payment and Conditions

All proposals, bids, or quotations shall be FOB Destination.

No partial payments shall be made for partial shipments.

Conditions of the “Acceptance of Equipment” must be met before any payment will be made.

1.14 Evaluation of Bids

Bids shall be evaluated based on the following:

- Delivery: as needed for the project
- Price: original cost and life cost (the bid may include an option for different prices for different delivery dates).
- Suitability: ability to meet the needs of the project
- Previous performance

The bid must include enough technical data and information to allow the evaluator to understand what is being bid, and how this meets the needs of the project.

Any and/or all exceptions shall be specifically enumerated with reference to the item in the specification that they are taking exception to. If these are not specifically listed, it will be assumed that the bidder will meet the specification, and will be held to it.

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1.15 Drawing List

Igloo Valley Interconnect Substation – 345kV/161kV

<u>Drawing Number</u>	<u>Description</u>	<u>Revision</u>	<u>Date</u>
S121SPS00	345kV/161kV Substation Structure Loading Criteria	A	9/28/2018
S121SPS01	345kV Substation 1-Phase Low Bus Support Structure	A	9/28/2018
S121SPS02	345kV Substation 1-Phase High Bus Support Structure	A	9/28/2018
S121SPS03	345kV Substation 3-Ph Low Switch Support Structure	A	9/28/2018
S121SPS04	345kV Substation CCVT Support Structure	A	9/28/2018
S121SPS05	345kV Substation Surge Arrester Support Structure	A	9/28/2018
S121SPS06	345kV Substation Wave Trap Support Structure	A	9/28/2018
S121SPS07	345kV Substation Double Bay A-Frame Structure	A	9/28/2018
S121SPS08	161kV Substation Single Bay 65' H-Frame Structure	A	9/28/2018
S121SPS09	345kV Substation 80' Static Mast Structure	A	9/28/2018
S121SPS10	345kV Substation 3-Ph High Switch Support Structure	A	9/28/2018
S121SPS11	161kV Substation CCVT/CTPT Support Structure	A	9/28/2018
S121SPS12	345kV Substation 1-Ph Bi-Level Bus Support Structure	A	9/28/2018

3500 Main Switching Station – 161kV

<u>Drawing Number</u>	<u>Description</u>	<u>Revision</u>	<u>Date</u>
S907SPS00	161kV Substation Structure Loading Criteria	A	9/28/2018
S907SPS01	161kV Substation 1-Phase Low Bus Support Structure	A	9/28/2018
S907SPS02	161kV Substation 1-Phase High Bus Support Structure	A	9/28/2018
S907SPS03	161kV Substation 3-Ph High Bus Support Structure	A	9/28/2018
S907SPS04	161kV Substation 3-Ph V-Switch Support Structure	A	9/28/2018
S907SPS05	161kV Substation CCVT/CTPT Support Structure	A	9/28/2018
S907SPS06	161kV Substation SSVT Support Structure	A	9/28/2018

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S907SPS07	161kV Substation Single Bay 65' H-Frame Structure	A	9/28/2018
S907SPS08	161kV Substation Double Bay/Expandable 65' H-Frame Structure	A	9/28/2018

FOR APPROVAL

GRAND RIVER DAM AUTHORITY

Substation Steel Structures

Technical Specifications

FOR APPROVAL

GRAND RIVER DAM AUTHORITY

SECTION 33 72 00 – SUBSTATION STEEL STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes work necessary to design, fabricate, test, package, ship and deliver tapered and tubular steel structures and accessories, including anchor bolts and ground connectors, as indicated and specified.

1.02 REFERENCES: Unless otherwise specified, the latest standards shall apply.

- A. Structures shall be designed in conformance with the following:
 - 1. American Institute of Steel Construction (AISC).
 - a. Manual of Steel Construction.
 - 2. American Society of Civil Engineers (ASCE).
 - a. Minimum Design Loads for Buildings and Other Structures, Standard 7.
 - b. Design of Steel Transmission Pole Structures, Standard 48.
 - c. Substation Structure Design Guide, Manual No. 113.
 - 3. American Concrete Institute (ACI).
 - a. Manual of Concrete Practice
 - b. 318 Building Code Requirements for Reinforced Concrete.
 - 4. International Conference of Building Officials.
 - a. International Building Code.
 - 5. American National Standards Institute (ANSI):
 - a. C2 - National Electrical Safety Code (NESC).
- B. Structures shall be fabricated, assembled and tested in conformance with the following:
 - 1. American National Standards Institute (ANSI):
 - a. B18.2.1 - Square and Hex Bolts and Screws including Hex Cap Screws, and Lag Screws.
 - b. B18.2.2 - Square and Hex Nuts.
 - 2. American Society for Testing and Materials (ASTM):
 - a. A6 - General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
 - b. A36 - Structural Steel.

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- c. A90 - Tests for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- d. A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips.
- e. A143 - Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- f. A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- g. A239 - Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip).
- h. A325 - High Strength Bolts for Structural Steel Joints, including suitable Nuts and Plain Hardened Washers.
- i. A354 - Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
- j. A370 - Mechanical Testing of Steel Products.
- k. A384 - Safeguarding Against Warpage and Distortion during Hot-Dip Galvanizing of Steel Assemblies.
- l. A385 - High-Quality Zinc Coating (Hot-Dip).
- m. A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.
- n. A449 - Quenched and Tempered Steel Bolts and Studs.
- o. A563 - Carbon and Alloy Steel Nuts.
- p. A572 - High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
- q. A577 - Ultrasonic Angle-Beam Examination of Steel Plates.
- r. A578 - Straight Beam ultrasonic Examination of Plain and Clad Steel Plates for Special Applications.
- s. A595 - Steel Tubes, Low-Carbon, Tapered for Structural Use.
- t. A615 - Deformed Billet Steel Bars for Concrete Reinforcement.
- u. A633 - Normalized High-Strength Low-Alloy Structural Steel.
- v. A673 - Sampling Procedures for Impact Testing of Structural Steel.
- w. A678 - Quenched and Tempered Carbon Steel Plates for Structural Applications.
- x. A871 - High-Strength Low-Alloy Structural Steel Plate with Atmospheric Corrosion Resistance.
- y. B6 - Zinc (Slab Zinc).

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- z. E165 - Liquid Penetrate Inspection Method.
- aa. E376 - Recommended Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.
- bb. E709 - Magnetic Particle Examination.
- cc. F1554 - Anchor Bolts, Steel, 36, 55, and 105ksi Yield Strength
- 3. American Society of Civil Engineers (ASCE):
 - a. Standard 48 - Design of Steel Transmission Pole Structures.
 - b. Manual 113 - Substation Structure Design Guide
- 4. American Welding Society (AWS):
 - a. C2.1 - Recommended Safe Practice for Thermal Spraying.
 - b. D1.1 - Structural Welding Code - Steel.
- 5. American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, Supplement A through E.
- 6. Zinc Institute:
 - a. Z170 15M - Inspection Manual for Hot-Dip Galvanized Products.
- 7. Other applicable standards suggested by the Supplier and approved by the Owner.
- C. In cases where the above standards are in conflict, unless specifically noted elsewhere in the Contract Documents, the most stringent requirements shall govern.

1.03 QUALITY ASSURANCE:

- A. Minimum Qualifications:
 - 1. Supplier shall be regularly engaged in the fabrication of substation steel structures.
 - 2. Supplier shall have previously designed and fabricated substation steel structures of the general size and type as specified.
 - 3. Supplier shall have complete facilities for the fabrication and galvanizing of the substation steel structures.
 - 4. Supplier shall have been supplying substation steel structures of similar size and type for a minimum of five (5) years.
- B. Inspection: Owner shall at any time be permitted to have representatives visit Supplier's facilities to examine the substation steel structures or any part to ascertain if the material and processes conform to this Specification.

PART 2 - PRODUCTS

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2.01 GENERAL:

- A. Provide new materials of domestic origin free from defects and suitable for their application and the mechanical stresses to which they will be subjected shall be used.
- B. Spare Materials: Provide 5 percent more fastening hardware than required to assemble and erect the structures.
- C. All steel used in the shafts, base plates and miscellaneous hardware shall be made by the open hearth, basic oxygen or electrical furnace process and conform to ASTM A6.
- D. Steel material shall have an absorbed energy requirement of 15 ft-lbs at -20 degrees F in the longitudinal direction when tested conforming to ASTM A370.
- E. Provide materials for shafts, arms, arm brackets, flanges and base plates up to 1-1/4-inch thickness conforming to ASTM A36, A572 (see paragraph G) or A871. Base plates greater than 1-1/4 inch and up to 4 inches in thickness shall conform to ASTM A633, Grade E or A871.
- F. Maximum silicon content for plate and angle materials shall be .04 to .06 percent in A572 steel.
- G. Provide zinc for hot-dipped galvanized coating conforming to ASTM B6.
- H. Provide structures complete with the following:
 - 1. Fastening hardware.
 - a. Provide bolts conforming to ASTM A325 or A354 Grade BC.
 - b. Nuts shall conform to ASTM A563.
 - 2. Brackets and grounding attachments.
 - 3. Provide anchor bolts conforming to ASTM F1554 Grade 36 with ASTM A563 heavy hex nuts and washers, and shall be galvanized according to ASTM A123, unless noted otherwise.
 - 4. Anchor bolt setting templates and/or anchor bolt retaining rings.
- I. Each member of a structure shall have identifying numbers and letters (piece marks), keyed to the fabrication and erection drawings for each substation, with characters a minimum of 1/2-inch high stamped into the steel prior to galvanizing. Piece marks shall be circled with black indelible ink after galvanizing.
- J. Provide specific instructions and torque values required for each type of connection.
- K. Disconnect switch stands temporarily used as bus support stands shall be identical to those being supplied for disconnect switches, with additional channels, spacers, etc. used to support the bus support insulators at the correct height.

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2.02 DESIGN CRITERIA:

- A. All structures specified shall be designed to resist the loads as specified in the Contract Drawings and in conformance to ASCE Substation Structure Design Guide, Manual No. 113.
- B. Deflections of structures under all the specified loads shall be less than those specified in ASCE Substation Structure Design Guide, Manual No. 113.
- C. All transmission towers, dead-end structures, self-supporting single-column shield wire structures or masts shall be designed for the loads indicated and be of tapered-steel construction.
- D. All steel structures designed as frames shall also be designed to include a maximum differential movement of 1 inch in any direction between adjacent supports.
- E. Structures shall have the number of support points (legs) and general layout indicated.
- F. Lightning diversion masts without shield wires shall be designed to resist wind induced oscillations or provide devices to reduce motion.
- G. Spacing and Clearance Requirements:

1. Nominal Voltage:	345-kV	161-kV
2. Basic Insulation Impulse Level (BIL):	1300-kV	750-kV
3. Minimum Phase-to-Phase Clearance:	119"	72"
4. Minimum Phase-to-Ground Clearance:	106"	62"
5. Minimum Clearance Above Grade:	216"	168"
- H. All equipment support structures, including rigid bus supports, shall be of tubular construction. Combination of shapes except as specified shall not be permitted. Structure shapes are defined as follows:
 - 1. Tubular - a structure composed of closed sections (tubes) of circular, multi-sided, or elliptical cross section and tapered or untapered - with loads carried in tension, compression and bending and having all members carrying calculated stresses.
- I. Baseplates and Anchor Bolts:
 - 1. The design, material, manufacture, testing and performance of the anchor bolts shall, at minimum, meet the requirements of the applicable sections of the latest revisions of the listed standards in these Specifications.
 - 2. Baseplates and anchor bolts shall be designed for structures to be supported by leveling nuts on the anchor bolts without grouting.

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3. Anchor bolt patterns may be dimensioned orthogonally or in bolt circles. Anchor bolt patterns with four bolts shall be square, and dimensioned in even one inch increments (i.e. 12 inches x 12 inches).
4. Anchor bolts shall be designed for embedment in pier with concrete having a minimum compressive strength of 4,000 psi in accordance with ACI 318.

J. Connections:

1. All field connections shall use galvanized bolts and nuts as fasteners. No field welding shall be required.
2. All bolted shear connections shall be designed as bearing connections with the bolts' threads in the shear plane or planes.
3. A lock-washer or Joslyn MF No. 1 locknut shall be provided for each structure bolt whether field or factory installed. Furnish at least five percent spares of each size bolt, nut, washer, lock-washer, locknut, etc., required in assembly. Self-locking type nuts shall not be used.

K. Arrange all structural members so that there are no pockets which can accumulate moisture without draining.

L. Provide all drilling, punching, mounting plates, brackets, etc., for addition of future equipment on the structures.

M. Provide all drilling, punching, mounting plates, brackets, etc., for all miscellaneous equipment to be mounted on the structures such as nameplates, fuse and terminal cabinets, phase identification tags, etc.

N. Provide a drawing with setting templates for all structures designed under this request.

2.03 FABRICATION CRITERIA:

A. Anchor Bolts:

1. Anchor bolts with two (2) zinc-coated nuts and flat washers per bolt shall be supplied for all foundations specified.
2. The nuts and the threaded portion of the anchor bolts plus a minimum of six additional inches shall be galvanized in accordance with ASTM A153 or B695, Class 50, Type I.
3. Anchor bolts shall be shipped as preassembled clusters or shall have steel templates adequate to properly align the bolts for each individual base plate shipped with them.

B. Overlapping and Contacting Surfaces: Seal weld all surfaces to conform to ASTM A385.

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- C. Vent and Drain Holes: Provide all fabricated assemblies with vent or drain holes to conform to ASTM A385.
- D. Bolts and Bolt Holes:
 - 1. Punched Holes: Holes may be punched in steel plate of 13/16-inch thickness or less. Plate material greater than 13/16-inch shall be drilled or subpunched and reamed or cut with a machine guided oxygen torch.
 - 2. All holes shall be perpendicular to the member and be cylindrical, sharp and clean cut without excessive tear-outs or depressions due to punching.
 - 3. Holes adjacent to the gauge line of bends shall be made after bending to avoid distortion.
- E. Member Identification: Mark with punched or bead welded identifying numbers a minimum of 1-inch high.
- F. Welds:
 - 1. Fabrication to conform to AWS D1.1, SECTION 2.
 - 2. Fabricate such that no field welding will be required.
 - 3. All welding materials shall conform to the latest revision of the "Electrode and Flux Specifications" set forth in ANSI/AWS D1.1.
 - 4. Welding shall be performed by the manual shielded metal-arc process, submerged-arc process, gas metal-arc process, or gas shielded flux-core-arc process.
 - a. Shield metal-arc welding shall be done with appropriate strength low hydrogen electrodes which have been properly conditioned in accordance with ANSI/AWS D1.1.
 - b. All preheating shall meet minimum recommended requirements by the steel manufacturer for each type and thickness of steel.
 - c. All welds shall be free from overlaps and cracks.
 - d. Longitudinal welds in female split joint areas and for a minimum of twelve (12) inches on either side of circumferential seam intersections or attachments intersections shall be 100% penetration with 100% fusion.
 - e. Longitudinal welds in other areas (e.g. pole shaft and arms) shall be 80% minimum penetration with 100% fusion to that depth in material 3/8" thick and less and shall be minimum 90% penetration with 100% fusion to that depth in material greater than 3/8 inch thick.
 - f. All circumferential welds shall be 100% penetration with 100% fusion for the entire length of the welds.

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- g. Base plate-to-pole shaft welds, arm base-to-arm welds, vangs-to-shaft welds, arm box joint welds, and all welds in major load carrying "tee" joints shall be 100% penetration with 100% fusion.
- h. All fillet welds shall have 100% fusion throughout the entire cross section of the welds.
- i. All undercutting shall conform to the following:
 - (1) Base plate to pole shaft welds, circumferential groove welds, longitudinal welds in a female telescoping joint, and arm shaft to pole connection plate welds, shall have no undercutting in excess of 0.008 inch with the exception that a 0.02 inch undercut is allowed for two (2) inches in any twelve inches of weld length.
 - (2) Longitudinal welds in vang, pull-offs, seam welds of arms, step welds, ladder lugs and other areas shall have no undercutting in excess of 0.02 inch.
- j. Porosity, fusion and inclusion type defects shall not exceed limits stated in ANSI/AWS D1.1.
- k. All weld repair shall be in accordance with ANSI/AWS D1.1 and repaired welds shall be inspected per the same methods and procedures specified for the original welds.
- l. Welding procedure and electrode selection shall be adjusted so as to provide a notch toughness of 15 ft-lbs absorbed energy at -20°F as measured by the charpy "V" notch test.
- 5. Mechanically remove all welding flux, slag and burrs.
- G. Tolerances: Variations from design dimensions shall not exceed the following:
 - 1. Anchor Bolt Cages: The maximum displacement of all bolts in the assembly from the centerline of the bolt holes shall not exceed 1/2 the distance between the edge of the bolts and the edge surface of the holes.
 - 2. Base Plate:
 - a. Eccentricity to center of shaft - plus or minus 1/8-inch.
 - b. Length and width - plus 1 inch or minus 1/4-inch.
 - 3. Holes:
 - a. Displacement - 1/2 the distance between the edge surface of the hole and the edge of the bolt.
 - b. Eccentricity - plus or minus 1/16-inch.

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c. Size and shape after galvanizing:

(1) Joints:

- (a) Punched holes - plus 1/16-inch larger than the design diameter.
- (b) Drilled, reamed and subpunched holes - plus 1/8-inch larger than the design diameter.

(2) Anchor bolt holes: See table below.

Bolt Ø	Hole Ø
0.75	0.875
0.875	1.0625
1.0	1.1875
1.125	1.375
1.25	1.5
1.375	1.625
1.5	1.8125
1.625	1.9375
1.75	2.0625
1.875	2.25
2.0	2.375
2.125	2.5
2.25	2.6875

2.04 SURFACE COATING :

A. Hot-Dip Galvanizing:

- 1. Surface Preparation: Pre-clean utilizing a caustic bath, acid pickle and flux or mechanical method to remove mill scale, rust, grease or other deleterious substances. Protect against embrittlement using the method specified in ASTM A143.
- 2. Members and Assemblies: Galvanize conforming to ASTM A123 after all bending, cutting, hole drilling, punching, welding and other fabricating operations are complete.
- 3. Fasteners: Galvanize to conform to ASTM A153.
- 4. Anchor Bolts: Galvanize the threaded portion of the bolt and 6 inches below the threads to conform to ASTM A123.
- 5. Finish: Provide a galvanized coating that is continuous, adherent and free of uncoated spots, blisters, chemical flux and projections which will interfere with the intended use of the structure and assemblies. Holes shall be clean and free of superfluous spelter.

2.05 MATERIAL TESTING:

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- A. Adequate tests and inspections shall be made to determine whether the material furnished conforms to the applicable standards.
- B. Ultrasonic inspection of all complete penetration welds and testing of the remainder of the welds shall be performed in accordance with ASCE 48. All personnel performing nondestructive testing shall be qualified in accordance with the American Society for Non-Destructive Testing Recommended Practice No. SNT-TC-1A, Supplement A through E.
- C. All materials for base plates, shafts, cross-arms, arms, and major attachments shall be tested as specified in ASCE 48 for notch toughness on a heat lot basis.
- D. Each individual base plate shall be tested after welding in accordance with ASTM A578.

PART 3 - EXECUTION

3.01 DELIVERY, HANDLING, STORAGE:

- A. Structures shall be shipped complete with missing components to the Point of Delivery after it has been inspected for compliance to these Specifications.
- B. Structures shall be boxed, crated, or otherwise suitably protected during shipment, handling and storage. Coated surfaces shall be protected against impact, abrasion, discoloration and other damage. Surfaces that are damaged during shipping shall be repaired by the Supplier.
- C. All accessory items shall be shipped with the structures. Boxes and crates containing accessory items shall be clearly marked and identified with the main structures. The contents of the boxes and crates shall also be indicated.
- D. Vehicles in which steel is shipped or stored shall be clean and free from foreign materials which could in any way injure the steel or the structure coating.
- E. Suitable attachments shall be provided on the bottom of the shipping assemblies for lifting or moving the substation structures and materials to their final location. Instructions for lifting the structures and materials shall be provided, including weight and center of gravity.
- F. Bundling straps or bands, or their equivalent, and related items as well as containers and crating shall be of sufficient strength to contain and protect the contents under normal export shipping, handling, and storage yard conditions. The banding material shall be galvanized or aluminized steel or other equivalent material which will not rust or otherwise deteriorate during shipping and storage. The containers shall be constructed in a manner which will prevent pilferage of contents from the unopened container.
- G. All items shall be tagged or marked as identified in the delivery schedule or submittals. A complete packing list and Bill of Materials shall be included with each shipment.

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- H. The exterior of boxes and crating shall carry identification of contents and shall be clearly marked with the Contract Number and Bill of Materials item numbers.
- I. Returnable containers and special shipping devices shall be returned by the Supplier's field representative at the Supplier's expense.
- J. Delivery shall not be considered complete until the Structures are unloaded at the Point of Delivery. The Supplier shall carry transportation insurance. All risk of loss including damage during shipment shall remain with the Supplier until delivery and unloading is completed at the Point of Delivery.
- K. Bundling by Piece:
 - 1. All like pieces for the same structure type shall be bundled and shipped together.
 - 2. Members for two separate structure types shall not be packaged into the same bundles.
 - 3. Small parts, for example, clip angles and U-bolts shall be packed in containers, according to part, size, and structure type. Several individual containers for more than one structure type may be packed into a larger one.
 - 4. Bolts shall be shipped in bulk sorted by diameter and length.
 - 5. Nuts and washers shall be shipped in bulk sorted by diameter.
- L. Bundling by Structure:
 - 1. As an alternative and in conjunction with bundling by piece, some structures may be bundled by structure.
 - 2. All the pieces necessary to erect one complete structure shall be bundled and shipped together.
 - 3. Members for two separate structures shall not be packaged into the same bundles.
 - 4. Small parts, for example clip angles and U-bolts, shall be packed in containers, according to part, size, and structure. Several individual containers for one structure may be packed into a larger one.
 - 5. Bolts shall be shipped in bulk sorted by diameter and length.
 - 6. Nuts and washers shall be shipped in bulk sorted by diameter.

3.02 FIELD SERVICES:

- A. Supplier shall provide field services representatives, including equipment and materials, to correct errors, discrepancies or omissions in the structures furnished as required by the Contractor at no additional cost.

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- B. Incorrectly fabricated pieces shall be repaired or replaced by the Supplier at no additional cost. Costs incurred due to delays caused by these incorrectly fabricated pieces shall be borne by the Supplier.
- C. If requested by the Contractor, the Supplier shall provide a field representative to travel to the Project Site and assist the Above Grade Subcontractor in identifying all pieces required for assembly. The trip shall be included as part of the field services and shall be provided at no additional cost.

3.03 COATING REPAIR:

- A. Galvanized Structures:
 - 1. All rust shall be removed from damaged areas by wire brushing, chipping, or sand blasting.
 - 2. Damaged areas shall be coated with a cold process galvanized coating as manufactured by ZRC Products Company (ZRC Cold Galvanizing Compound) or approved equal in accordance with the manufacturer's recommendations.
- B. Painted Structures:
 - 1. Remove all rust by wire brushing, chipping, or sand blasting.
 - 2. Prime the bare metal with the primer furnished by the Supplier. Apply in accordance with Supplier's instructions.
 - 3. Apply two finish coats of paint with the paint supplied by the Supplier. Apply in accordance with Supplier's instructions.

3.04 WARRANTY:

- A. All parts and material shall be new and free from defects or imperfections. All workmanship shall meet or exceed accepted construction practices, resulting in a neat and professionally finished appearance. All manufacturing errors or omissions required to be corrected in the field shall be done by the Manufacturer or their duly authorized representative.
- B. The Supplier shall warrant the supplied substation structures and all components therein against defects in equipment, materials, and/or workmanship for a period of not less than five (5) years from the date of delivery and acceptance by the Owner.

END OF SECTION 337200

GRAND RIVER DAM AUTHORITY

High Voltage Switches

Technical Specifications

FOR APPROVAL

GRAND RIVER DAM AUTHORITY

DATA SHEET

345kV

QUANTITY of SWITCHES for this DATA SHEET: 8

Substation Name: **Igloo Valley Substation**

Switch Type: 345kV, 3000A, Breaker Disconnect Switches

VOLTAGE (L-L):	345	kV
BIL:	1300	kV
AMPACITY (Continuous):	3000	A
AMPACITY (Momentary):	164	kA Peak
TYPE OF MECHNISM:	Double End Break	
MOUNTING:	Horizontal	
PHASE SPACING:	15	Feet
SWITCH STAND:	See S121SPS03	
OPERATOR:	Manual group operated	
Direction of Rotation:	CCW to close	
Switch Insulator:	NEMA Type TR 367 (minimum)	
Switch Tag(s):	Yes	
Manufacture:	Southern States Pascor Alstom Turner	

GRAND RIVER DAM AUTHORITY

DATA SHEET

345kV

QUANTITY of SWITCHES for this DATA SHEET: 2

Substation Name: **Igloo Valley Substation**

Switch Type: 345kV, 3000A, Line Disconnect Switches

VOLTAGE (L-L):	345	kV
BIL:	1300	kV
AMPACITY (Continuous):	3000	A
AMPACITY (Momentary):	164	kA Peak
TYPE OF MECHNISM:	Double End Break	
MOUNTING:	Horizontal	
PHASE SPACING:	15	Feet
SWITCH STAND:	See S121SPS07	
OPERATOR:	Motor operated, group operated	
Direction of Rotation:	CCW to close	
Switch Insulator:	NEMA Type TR 367 (minimum)	
Switch Tag(s):	Yes	
Manufacture:	Southern States Pascor Alstom Turner	

GRAND RIVER DAM AUTHORITY

DATA SHEET

345kV

QUANTITY of SWITCHES for this DATA SHEET: 2

Substation Name: **Igloo Valley Substation**

Switch Type: 345kV, 3000A, Xfmr Disconnect Switches

VOLTAGE (L-L):	345	kV
BIL:	1300	kV
AMPACITY (Continuous):	3000	A
AMPACITY (Momentary):	164	kA Peak
TYPE OF MECHNISM:	Double End Break	
MOUNTING:	Horizontal	
PHASE SPACING:	15	Feet
SWITCH STAND:	See S121SPS10	
OPERATOR:	manual operated, group operated	
Direction of Rotation:	CCW to close	
Switch Insulator:	NEMA Type TR 367 (minimum)	
Switch Tag(s):	Yes	
Manufacture:	Southern States Pascor Alstom Turner	

GRAND RIVER DAM AUTHORITY

DATA SHEET

161kV

QUANTITY of SWITCHES for this DATA SHEET: 2

Substation Name: **Igloo Valley**

Switch Type: 161kV, 2000A, Line Disconnect Switches

VOLTAGE (L-L):	161	kV
BIL:	750	kV
AMPACITY (Continuous):	2000	A
AMPACITY (Momentary):	114	kA Peak
TYPE OF MECHNISM:	Center Break "Vee"	
MOUNTING:	Vertical	
PHASE SPACING:	13	Feet
SWITCH STAND:	See S121SPS08	
OPERATOR:	Gear Box, group operated	
Direction of Rotation:	Left	
SPECIAL FEATURES:	NA	
Switch Tag(s):	Yes	

GRAND RIVER DAM AUTHORITY

DATA SHEET

161kV

QUANTITY of SWITCHES for this DATA SHEET: 20

Substation Name: **3500 Main**

Switch Type: 161kV, 2000A, Breaker Disconnect Switches

VOLTAGE (L-L):	161	kV
BIL:	750	kV
AMPACITY (Continuous):	2000	A
AMPACITY (Momentary):	114	kA Peak
TYPE OF MECHNISM:	Center Break "Vee"	
MOUNTING:	Horizontal	
PHASE SPACING:	13	Feet
SWITCH STAND:	See S907SPS04	
OPERATOR:	Gear Box, group operated	
Direction of Rotation:	Left	
SPECIAL FEATURES:	NA	
Switch Tag(s):	Yes	

GRAND RIVER DAM AUTHORITY

DATA SHEET

161kV

QUANTITY of SWITCHES for this DATA SHEET: 6

Substation Name: **3500 Main**

Switch Type: 161kV, 2000A, Line Disconnect Switches

VOLTAGE (L-L):	161	kV
BIL:	750	kV
AMPACITY (Continuous):	2000	A
AMPACITY (Momentary):	114	kA Peak
TYPE OF MECHNISM:	Center Break "Vee"	
MOUNTING:	Vertical	
PHASE SPACING:	13	Feet
SWITCH STAND:	See S907SPS07 and S907SPS08	
OPERATOR:	Gear Box, group operated	
Direction of Rotation:	Left	
SPECIAL FEATURES:	NA	
Switch Tag(s):	Yes	

GRAND RIVER DAM AUTHORITY

1. GENERAL

- A. This specification covers the furnishing of the switches listed on the Data Sheet. The switches shall be complete with insulators, operating arms and mechanism, mounting brackets, hardware, and documentation.
- B. As used herein "switch" means a disconnect switch including operating mechanism whether manual or motor operated with all operating piping and interphase rods, shop and field erection nuts, bolts, and fasteners as well as station post insulators.
- C. The disconnect switches and their appurtenances shall conform to this specification and shall conform to the requirements for the latest published IEEE Standard for air switches and bus supports and the NEMA Standard for power switching equipment.

2. SPECIFICATIONS

- A. Disconnect Switches
 - 1. Disconnect switches shall be of the 3-pole group-operated type, for either vertical or horizontal mounting with ANSI 70 light gray station post insulators.
 - 2. Mechanical strength of switch and insulators shall be coordinated with all forces to which they may be subjected during normal use and shall meet the latest applicable NEMA and USA Standards. The switches shall be designed such that no appreciable interphase forces will be transmitted to the switch support structure during switch operation. Switches shall either open or close satisfactorily under a deposit of hard ice 3/4 inch in thickness. Switch-blades shall be counter balanced to prevent them from falling closed from any open position.
 - 3. All electrical contacts shall be silver to silver. The Vendor/manufacturer shall state the width and thickness of the silver plating on the switch contacts (female) and on the switch arm contact (male) with the bid document.
 - 4. Stub-type arcing horns shall be provided to minimize arcing of main switch contacts.
 - 5. Terminal pads of switches shall be suitable for use with aluminum connections, and the drill pattern shall comply with NEMA pad dimensions. The typical drill pattern should allow the use of four 1/2-inch diameter bolts

GRAND RIVER DAM AUTHORITY

on 1 ¼ inch centers, and if different, shall be stated in the proposal.
Terminals will be furnished by others.

6. If the switch is to operate at a voltage of or greater than 199 kV line to ground, 345 kV phase to phase, then adequate corona suppression shall be engineered into the switch such that detectable corona is not present at operating voltage.
7. If disconnect switches are specified for manual operation, they shall be designed with the provision for future replacement of the manual operating mechanism with a motor operated mechanism.
8. All bearings shall be sealed-type, non-rusting ball or roller.
9. Current path(s) through the switch shall not go through the bearings, springs, or hardware.

B. Operating Mechanism

1. Switches shall be furnished with an operating mechanism complete with vertical operating pipes, interphase rods, couplings, guide bearings, flexible braid grounding strap, and offsets as required for operation from the switch stand to provide group operations of all three blades from one operating mechanism. An indicator showing the status of the open and closed positions of the switch shall be provided at each operating mechanism. Each mechanism shall have provisions for padlocking in either position.
2. Manually operated switches.
 - a. The switch handle or gear box is to be designed for mounting approximately 2'-6" above the switch structure foundation and shall be readily operated by one man.
3. Motor operated switches.
 - a. Motor shall be for DC operation. The supply motor current information shall be provided with the bid. The motor and control voltage shall be 125VDC, unless listed otherwise on the Data Sheet. Operating time of motor operator is to be approximately 10 seconds or less. Motor operated mechanism cabinet shall be weatherproof. A cabinet heater shall be furnished with thermostat to operate on 120 or 240 VAC.
 - b. An auxiliary switch shall be furnished with at least 8 individually and fully adjustable contacts, which are to include four "a" and four "b" contacts.

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- c. Mechanism shall have capability of manual operation with handle to be furnished. Motor operation shall be electrically disconnected during manual hand cranking of switch.
- d. Motor operator mechanism shall have capability of being manually tested at the mechanism cabinet. Remote control of motor operator shall be inhibited during manual testing of motor operator.
- e. The requirements of the latest revision of ANSI C37.32-1972 for power operated mechanisms shall apply.
- f. If switches are to be motor operated, the centerline of the motor mechanism cabinet shall be approximately 2'-6" above the switch structure foundation.

C. GROUNDING

The switch shall be supplied with an 18" long ground strap and the necessary hardware to attach the strap to the operating pipe and the switch stand steel. The strap shall have the same ampacity (or greater) than a 4/0 copper cable.

D. EQUIPMENT NAMEPLATE

Each switch and motor operator will have nameplate identifying the following information:

- A. Manufacturer.
- B. Rating in amperes.
- C. Voltage in kV for switches; operating voltage for motor operator.
- D. Instruction book number.
- E. Catalog number.
- F. Year manufactured.

3. PREPARATION FOR SHIPMENT AND SHIPMENT

- A. All disconnect switches shall be carefully prepared for shipment including packaging, tagging, and boxing of small parts in substantial containers. Particular care shall be used in placing suitable separators between heavy pieces and extra long pieces, and also general use of non-abrading dunnage materials in such a manner as to prevent damage to porcelain insulators and zinc coatings in transit.
- B. Any particular shipment shall include complete switches with no extra pieces or missing pieces.

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- C. Proposal shall be based on F.O.B. job site not F.O.B. shipping point transportation allowed.

4 CORRESPONDENCE

All technical correspondence, transmittal letters, technical information, approval drawings, final drawings, prints, and instruction books should be mailed as per section 1:

5 DOCUMENTS/DRAWINGS

- A. The Vendor/manufacturer shall furnish three (3) copies of outline drawings and detail and assembly drawings for approval. Each drawing submitted shall be clearly marked with the name of the project, GRDA's name, and GRDA's purchase order number. When catalog pages are submitted, the applicable items shall be indicated. These approval drawings shall be submitted as soon as possible but no later than six weeks after award of purchase.
- B. A drawing index listing all drawings, instruction manuals, complete parts list with appropriate identifying part numbers, and switch and motor operator adjustment instructions to be submitted for the equipment furnished under these specifications, shall be included with the initial submittal of approval drawings.

The drawings are to be mailed to GRDA as soon as possible, and in any event, no later than six (6) weeks prior to date of shipment of equipment covered by these specifications.

The final drawing will show information described under approval drawings.

- c. If complete bills of material are not included on above drawings, then six (6) separate copies, fully describing equipment shall be supplied as soon as possible after drawing approval.
- d. Bill of material shall include a detailed list of all parts, containing part number, description of part, and identification number. The identification number will be shown on drawings such that location of each part is evident. Exploded type drawing would be desirable to show this information.
- e. Six (6) copies of all other drawings and data describing the equipment furnished shall be sent to the Company prior to shipment of the equipment.

6 INSTRUCTION MANUALS

GRAND RIVER DAM AUTHORITY

- A. The seller shall furnish six (6) complete and final copies of instruction manuals for each purchase order, and/or substation, and/or type of switch no later than thirty (30) days prior to shipment of the equipment.
- B. The instruction manuals shall cover complete installation including any special factory or field adjustment instructions, operating and maintenance instructions, drawings and parts lists for each item of equipment furnished.
- C. The instruction manuals shall be bound in the manufacturer's standard heavy duty binders, suitable for rough usage. The front cover shall be assembled so that GRDA's name, location of equipment, name of equipment, and basic capacity rating of equipment can be read.
- D. Where applicable, a list of recommended spare parts with the price of each item and a schedule of required lubricants, as recommended for each item, shall be included in the instruction manual.
- E. The instruction manuals shall show all nameplate information and shop order numbers of each item of equipment.

7 **WARRANTY**

Any equipment specified herein or part thereof that shall develop defects not disclosed prior to acceptance by GRDA within one year after energization or eighteen months after delivery, whichever occurs first, shall be promptly replaced by the Vendor/manufacturer free of charge to GRDA.

GRAND RIVER DAM AUTHORITY

Insulators

Technical Specifications

FOR APPROVAL

GRAND RIVER DAM AUTHORITY

1.0 General

Insulators for outdoor use shall be furnished in accordance with this section and as indicated on the drawings. The requirements of the Specification Data Sheet(s) and drawings shall govern should conflicts occur between them and the written text of these specifications. Additional general equipment requirements are presented in these specifications

2.0 Codes and Standards

All equipment furnished under these specifications shall conform to the applicable standards of ANSI, IEEE, and NEMA.

All material and devices shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards."

3.0 Ratings

Insulators shall conform to the requirements indicated on the Specification Data Sheet(s) included at the end of this section.

4.0 Design Requirements

Fittings and clamps shall be hot-dip galvanized, malleable iron or bronze. Aluminum fittings and clamps shall not be used.

5.0 Shipping

Each insulator assembly shall be shipped preassembled from the factory. Insulators shall be shipped in wooden crates and protected from damage during shipping.

GRAND RIVER DAM AUTHORITY

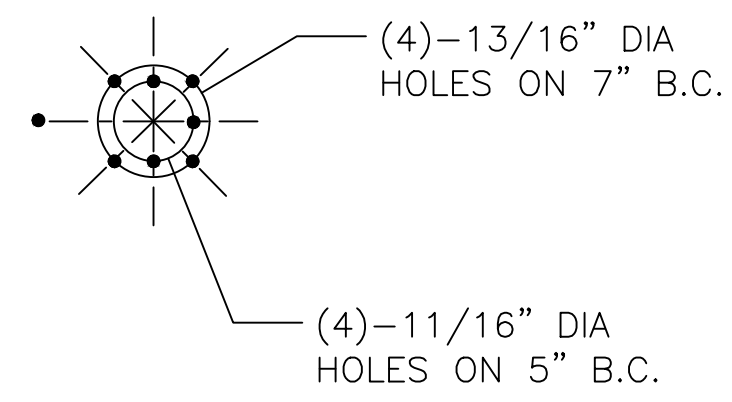
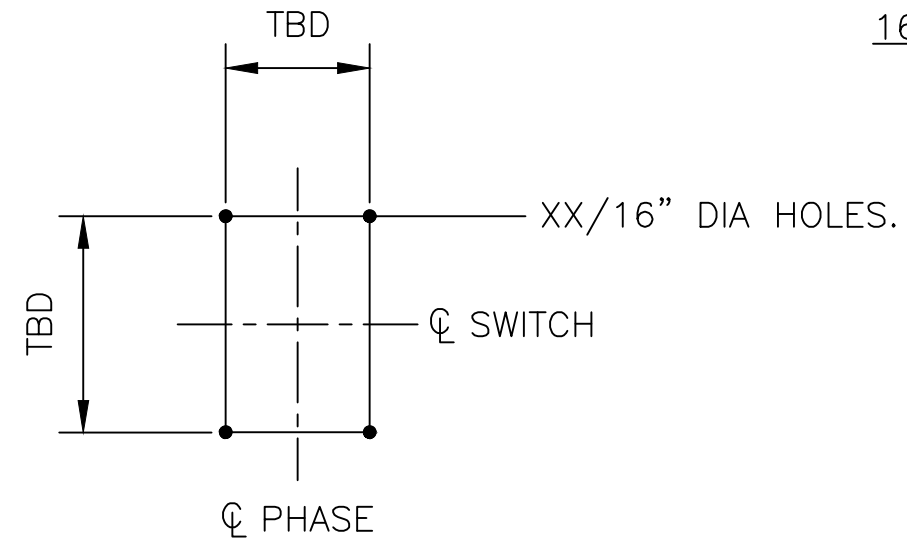
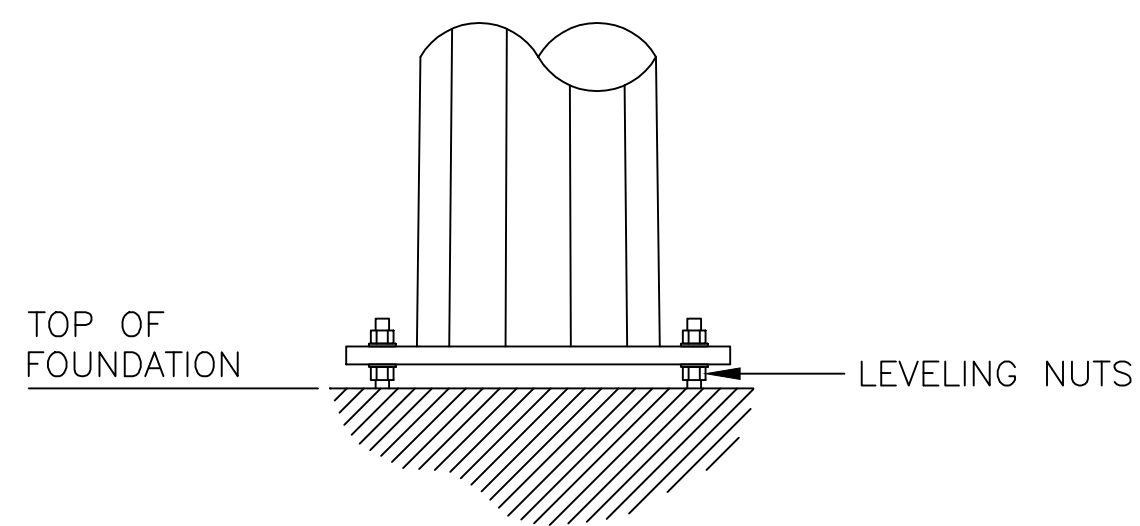
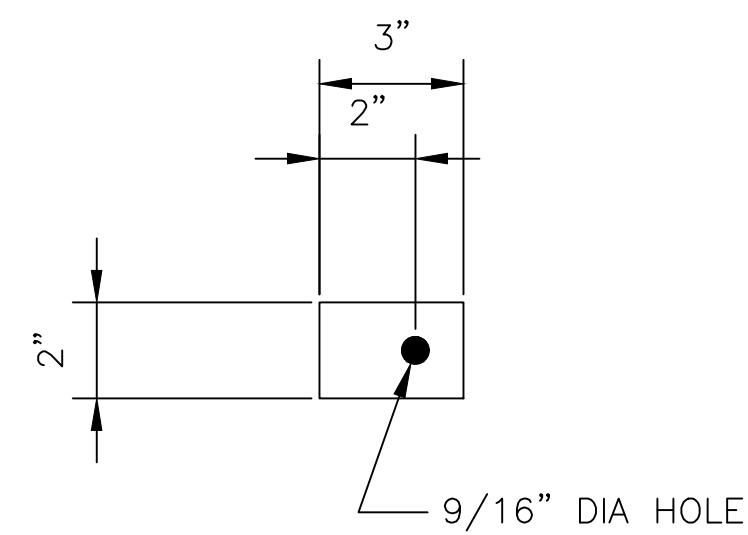
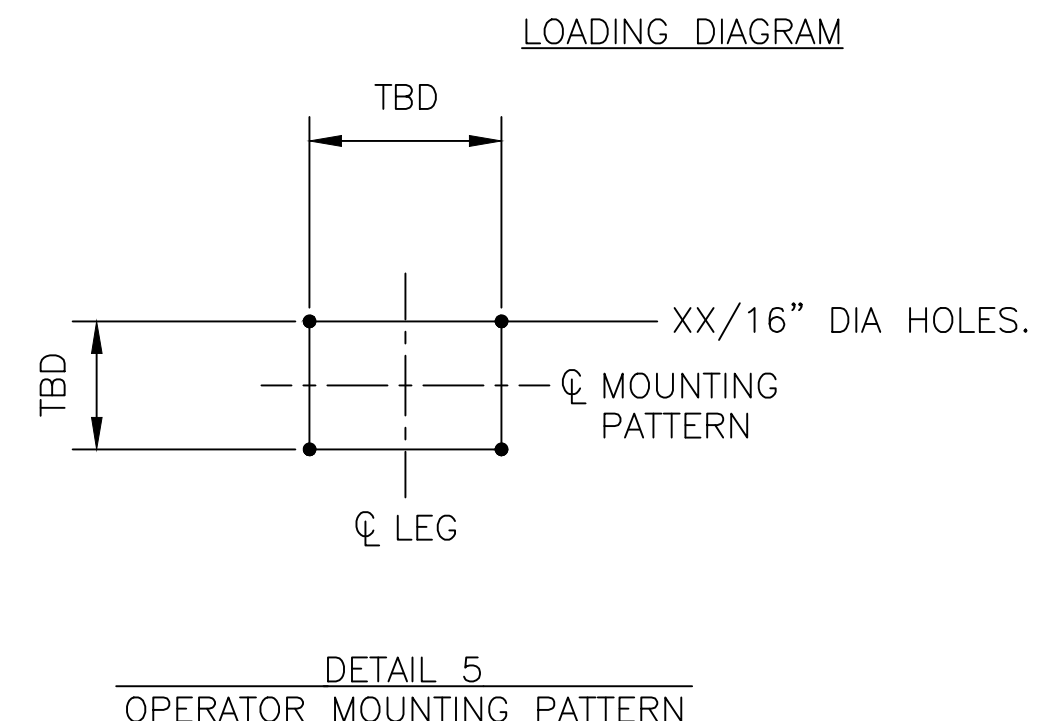
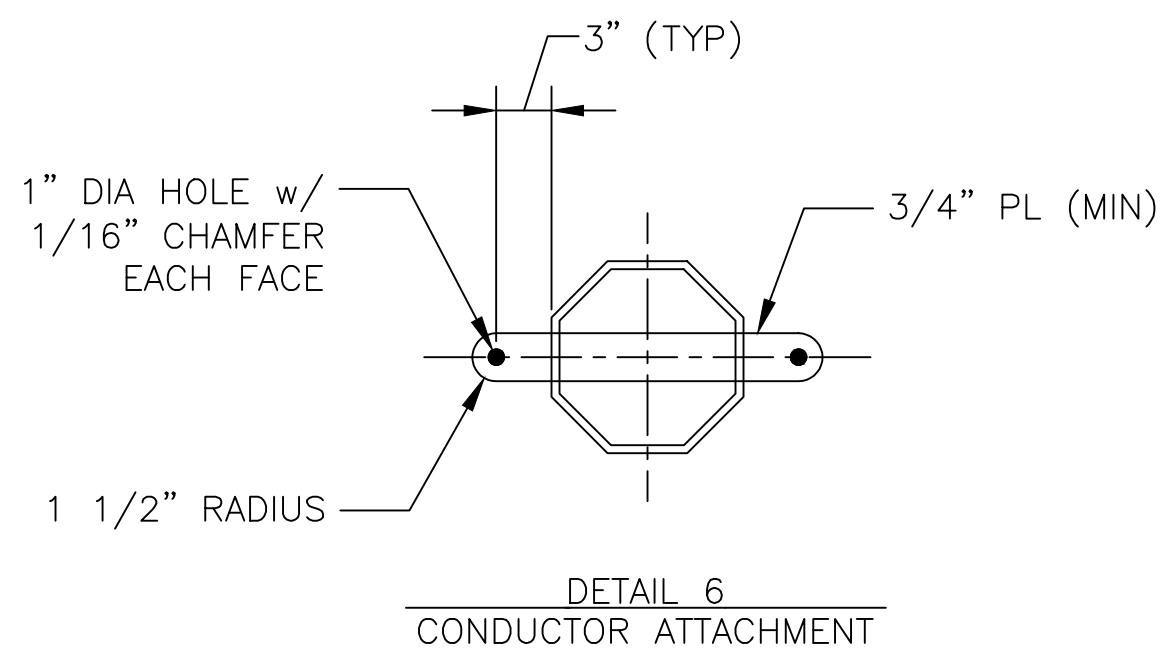
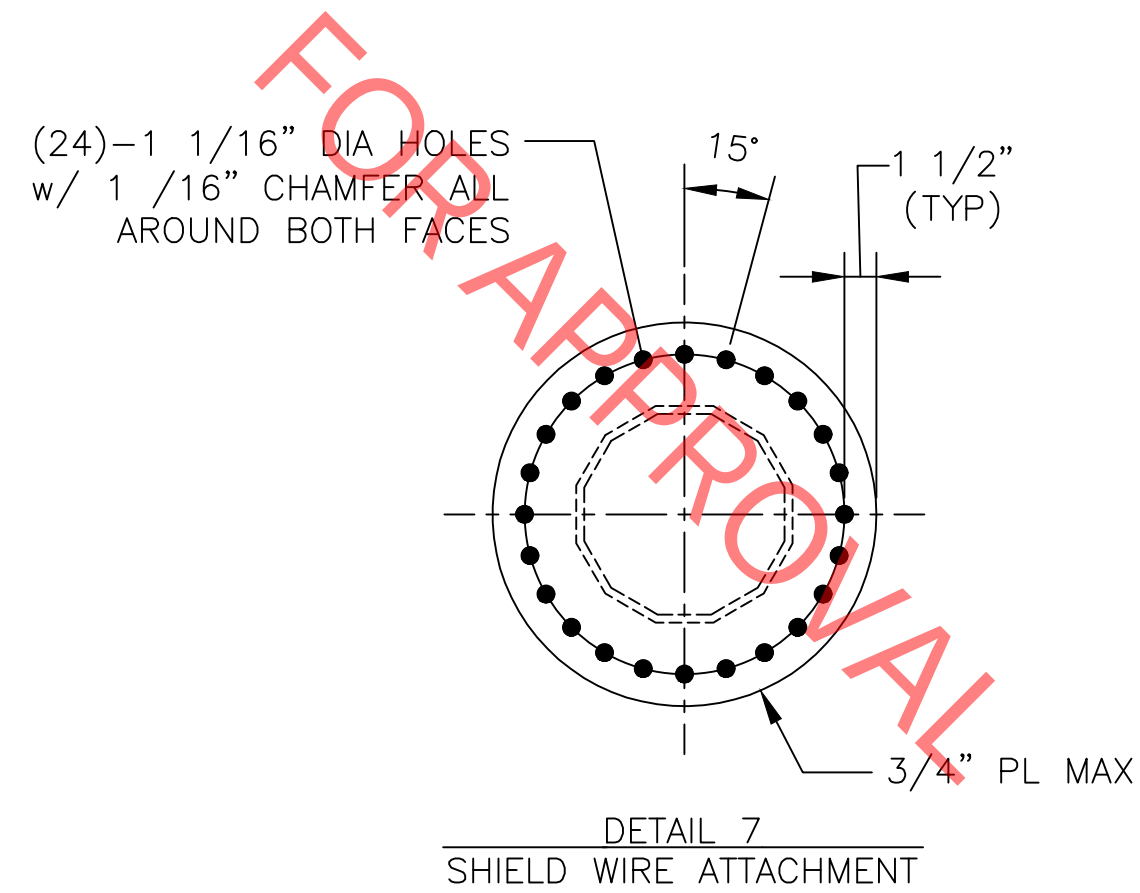
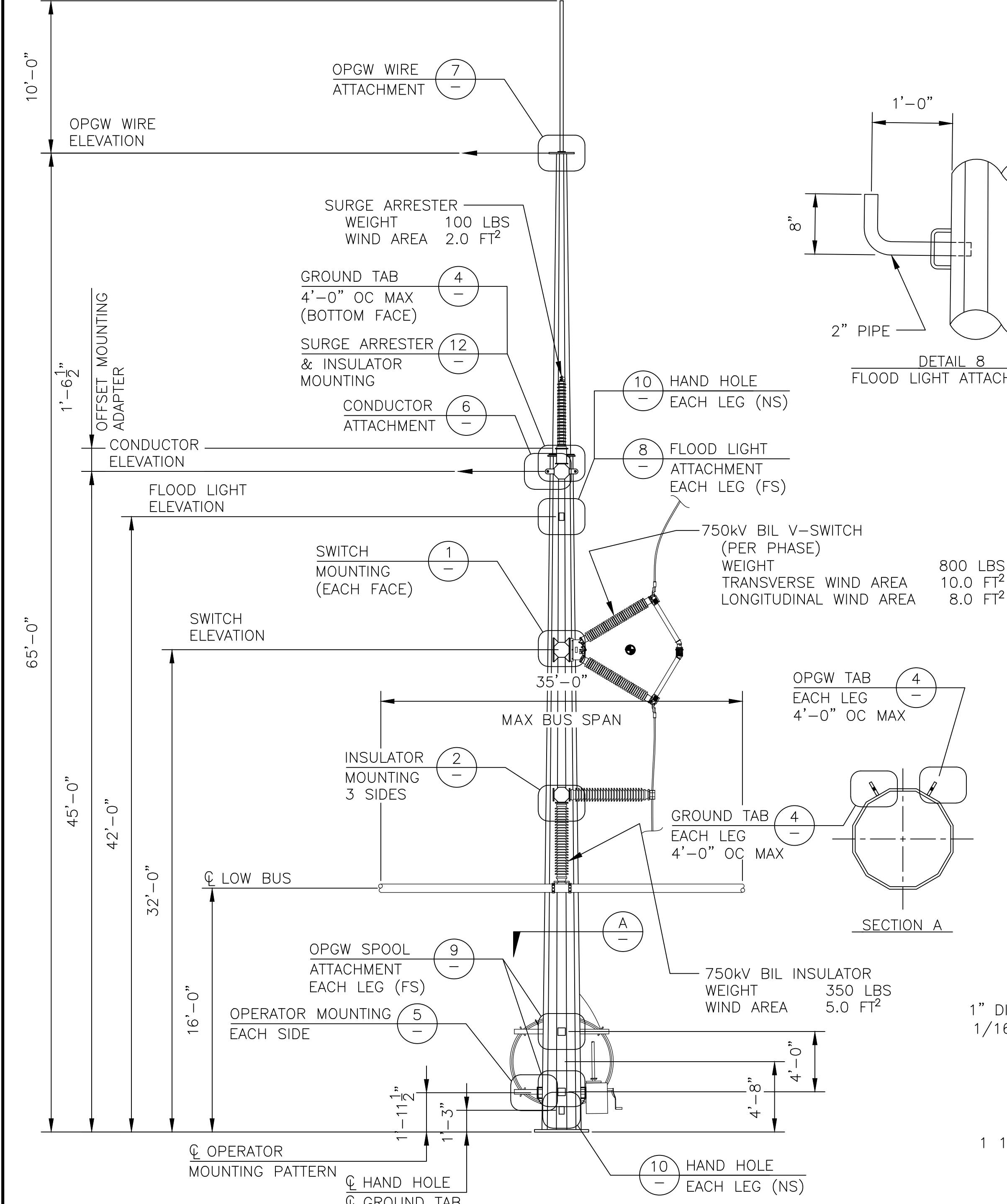
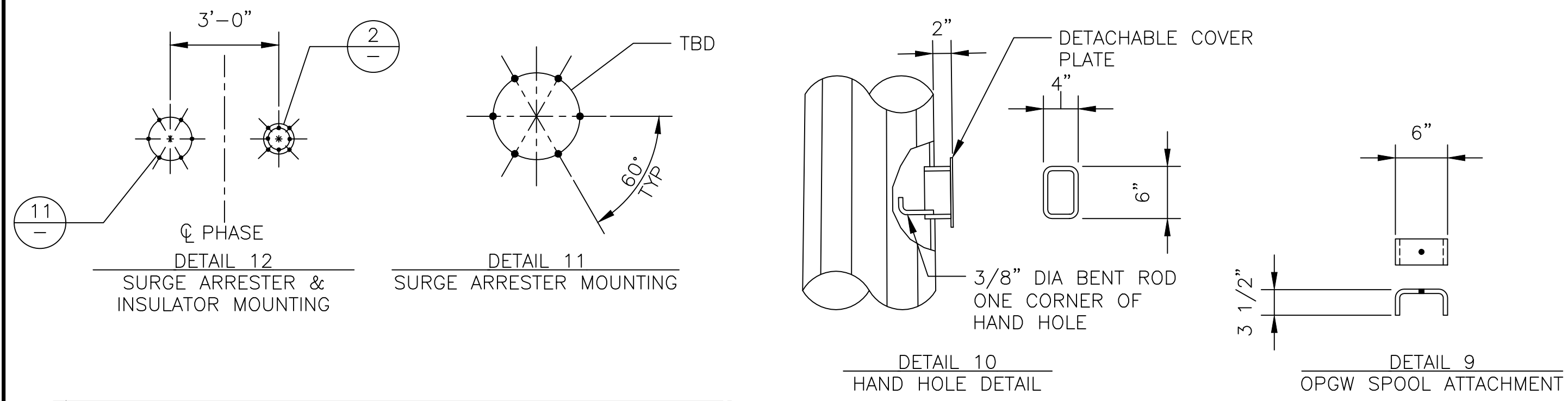
6.0 Specification Data Sheet(s)

Insulators shall be furnished in accordance with the following. These quantities include spares and do not include the switch insulators.

Station Post Insulator Ratings	345 kV
Igloo Valley - Quantity	Underhung – 7 (161 kV, See following page for specification). Standard – 89
Withstand, kV	
Impulse	1300
Low frequency, dry	745
Low frequency, wet	525
Electrical distance, inches	
Arcing	90
Leaking	231 (min)
Strength, pounds	
Cantilever, upright (min)	3000 lbs
Cantilever, underhung (min)	3000 lbs
Tension (min)	20,000 lbs
Torsional (min)	120,000 ft-lbs
Compressive (min)	60,000 lbs
Bolt Circle diameter, inches	Top: 5 Bottom: 12
Porcelain color shall be ANSI 70 gray	
Height	106"
Type	Tapered or Uniform stack

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Station Post Insulator Ratings	161 kV
3500 Main - Quantity	Underhung – 20 Standard – 113
Withstand, kV	
Impulse	750
Low frequency, dry	485
Low frequency, wet	315
Electrical distance, inches	
Arcing	52
Leaking	132 (min)
Strength, pounds	
Cantilever, upright	3,500 lbs
Cantilever, underhung	3,500 lbs
Tension	25,000 lbs
Torsional	120,000 ft-lbs
Compressive	75,000 lbs
Bolt Circle diameter, inches	Top: 5 Bottom: 7
Porcelain color shall be ANSI 70 gray	
Height	62"
Type	Tapered or Uniform stack



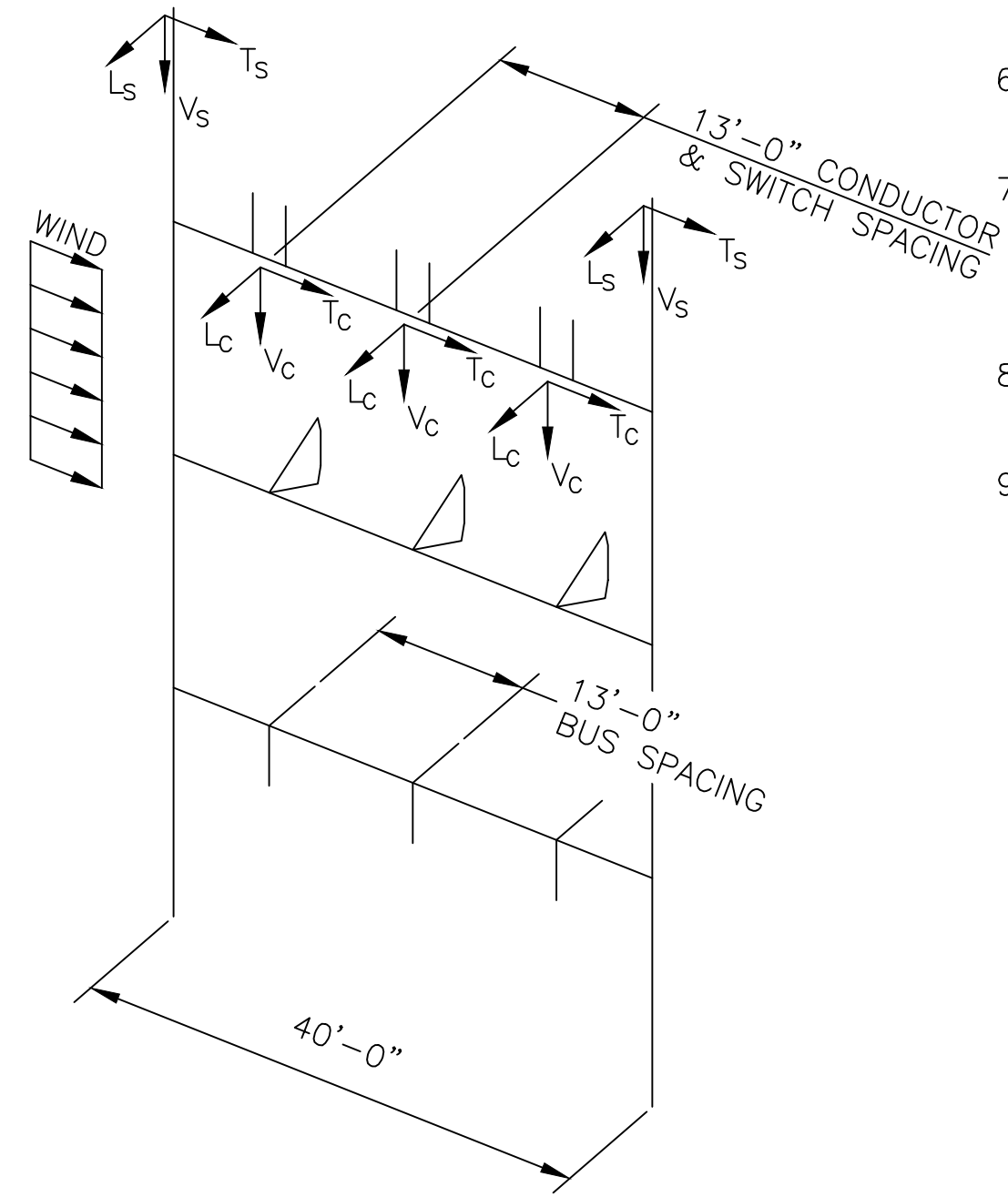
WIRE LOADS (0-15' LINE ANGLE):

H-FRAME STRUCTURES SHALL BE ANALYZED AND DESIGNED USING ULTIMATE STRENGTH DESIGN (USD) FOR THE FOLLOWING WIRE LOADS IN CONJUNCTION WITH THE STRUCTURE LOADS SHOWN ON DRAWING S907SPS00.

LOAD CASE		CONDUCTOR			OPGW			OVERLOAD FACTORS		
		(KIPS)			(KIPS)			WIND	VERTICAL	WIRE TENSIONS
		V _C	T _C	L _C	V _S	T _S	L _S			
CONDITION 1	NESC HEAVY	5.0	2.4	13.6	1.2	0.7	2.6	2.5	1.5	1.65
	EXTREME WIND	3.0	2.2	8.4	0.7	0.5	1.4	1.1	1.1	1.1
	EXTREME ICE	4.9	1.6	11.6	1.5	0.4	2.3	1.1	1.1	1.1
	ICE & WIND	4.9	2.0	11.8	1.5	0.7	2.5	1.0	1.0	1.0
	DEFLECTION	2.6	0.5	3.8	0.5	0.1	0.4	1.0	1.0	1.0
	CONSTRUCTION	5.7	1.7	0.5	1.6	0.7	0.2	1.0	1.0	1.0
CONDITION 2	NESC HEAVY	-1.1	1.7	6.6	0.3	0.7	2.4	2.5	1.5	1.65
	EXTREME WIND	-1.0	1.1	3.9	0.2	0.4	1.1	1.1	1.1	1.1
	EXTREME ICE	-1.2	1.2	5.9	0.4	0.6	2.3	1.1	1.1	1.1
	ICE & WIND	-1.3	1.4	6.1	0.4	0.7	2.4	1.0	1.0	1.0
	DEFLECTION	-0.3	0.4	1.9	0.1	0.1	0.3	1.0	1.0	1.0
	CONSTRUCTION	-0.6	0.7	3.0	0.1	0.2	0.6	1.0	1.0	1.0

1. FOR WIRE LOAD LOCATIONS, SEE LOADING DIAGRAM BELOW.
2. WIRE LOADS INCLUDE OVERLOAD FACTORS.

DESCRIPTION	TYPE	MAX INITIAL TENSION (LBS)	WIND SPAN (FT)	WEIGHT SPAN (FT)
CONDUCTOR	ACSR LAPWING	4,100	150	300
OPGW	AFL CC-57/465	1,450	150	300



LOADING DIAGRAM

DESIGN NOTES:

1. ALL LOAD CASES (EXCLUDING NESC HEAVY) SHALL USE THE FOLLOWING WIND DESIGN PARAMETERS:

EXPOSURE HEIGHT	44 FT	(2/3 x h)
EXPOSURE FACTOR	1.065	

2. ALL WIND LOADS SHALL BE MULTIPLIED BY THE FOLLOWING SHAPE FACTORS:

RIGID BUS/POST INSULATORS	1.0
ROUND SECTIONS	0.9
12 OR 16 SIDED SECTIONS	1.0
8 SIDED SECTIONS	1.4
SQUARE/RECTANGULAR SECTIONS	2.0

3. ALL LOAD CASES (EXCLUDING NESC HEAVY) SHALL USE THE FOLLOWING ICE DESIGN PARAMETERS:

EXPOSURE FACTOR	1.029

4. EQUIPMENT/INSULATOR WIND AREAS SHOWN INCLUDE SHAPE FACTORS AND SHOULD NOT BE MODIFIED.

5. DEFLECTIONS SHALL BE CALCULATED FOR ALL POINTS OF INTEREST, INCLUDING SWITCH TERMINAL PADS, HIGH POINTS OF RIGID BUS, CONDUCTOR ATTACHMENTS, AND WHERE OTHERWISE NOTED. DEFLECTION LIMITS FOR DEFLECTION LOAD CASES SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

- i. HORIZONTAL DEFLECTION OF VERTICAL MEMBERS: $1/100$ OF THE HEIGHT AT THE POINT OF INTEREST
- ii. VERTICAL DEFLECTION OF HORIZONTAL MEMBERS: $1/200$ OF THE HORIZONTAL SPAN
- iii. HORIZONTAL DEFLECTION OF HORIZONTAL MEMBERS:
 - a. CLASS 'A' SWITCH SUPPORT MEMBERS: $1/200$ OF THE HORIZONTAL SPAN
 - b. CLASS 'B' ALL OTHER SUPPORT MEMBERS: $1/100$ OF THE HORIZONTAL SPAN

6. DEAD WEIGHT OF ALL HORIZONTAL RIGID BUS SHALL BE INCREASED BY 25% AS AN ALLOWANCE FOR CONTINUOUS LOOSE CABLE DAMPER.

7. ALL STRUCTURAL STEEL SHALL BE HOT-DIPPED GALVANIZED. ALL STRUCTURAL STEEL SHALL BE SUPPORTED ON LEVELING NUTS WITHOUT GROUT (DETAIL 3) AND ALL BASE PLATES AND ANCHOR BOLTS SHALL BE DESIGNED AND DETAILED ACCORDINGLY.

8. STRUCTURE DESIGN AND DETAILING SHALL INCLUDE SUPPORT PROVISIONS FOR SWITCH OPERATOR MECHANISMS AND PIPE.

9. SEE DRAWING S907SPS00 FOR ADDITIONAL LOADING INFORMATION.



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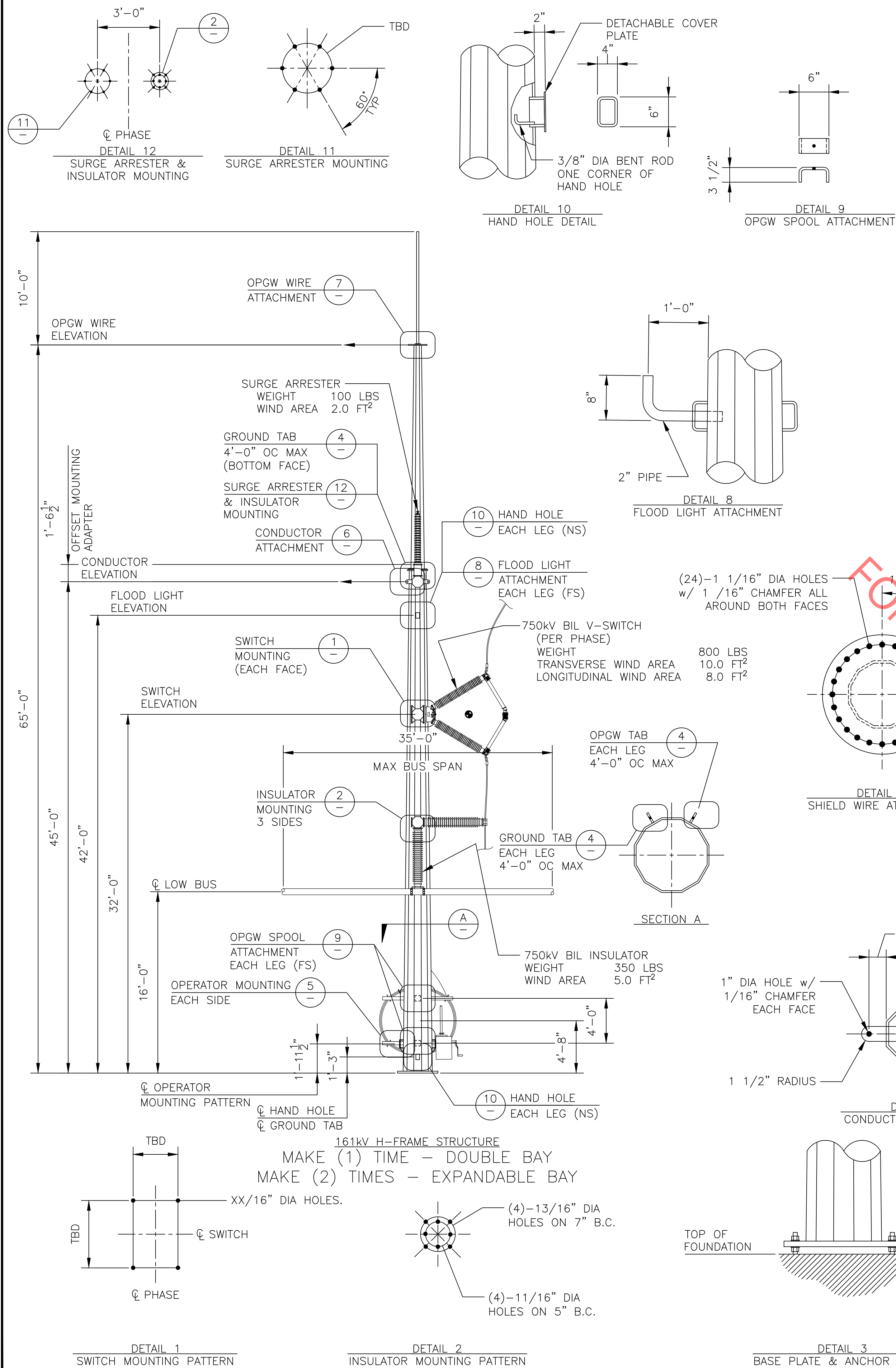
GRAND RIVER DAM AUTHORITY
3500 MAIN SUBSTATION S907
PRYOR, OKLAHOMA
161KV

161kV SUBSTATION
SINGLE BAY 65' H-FRAME STRUCTURE

SCALE: NTS	DRAWN BY: JM	ENGR: JM	APPD: RG

 GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINITA, OK 74301	CH: TL	DATE: 09/28/2018
	DRAWING No. S907SPS07	REV. A

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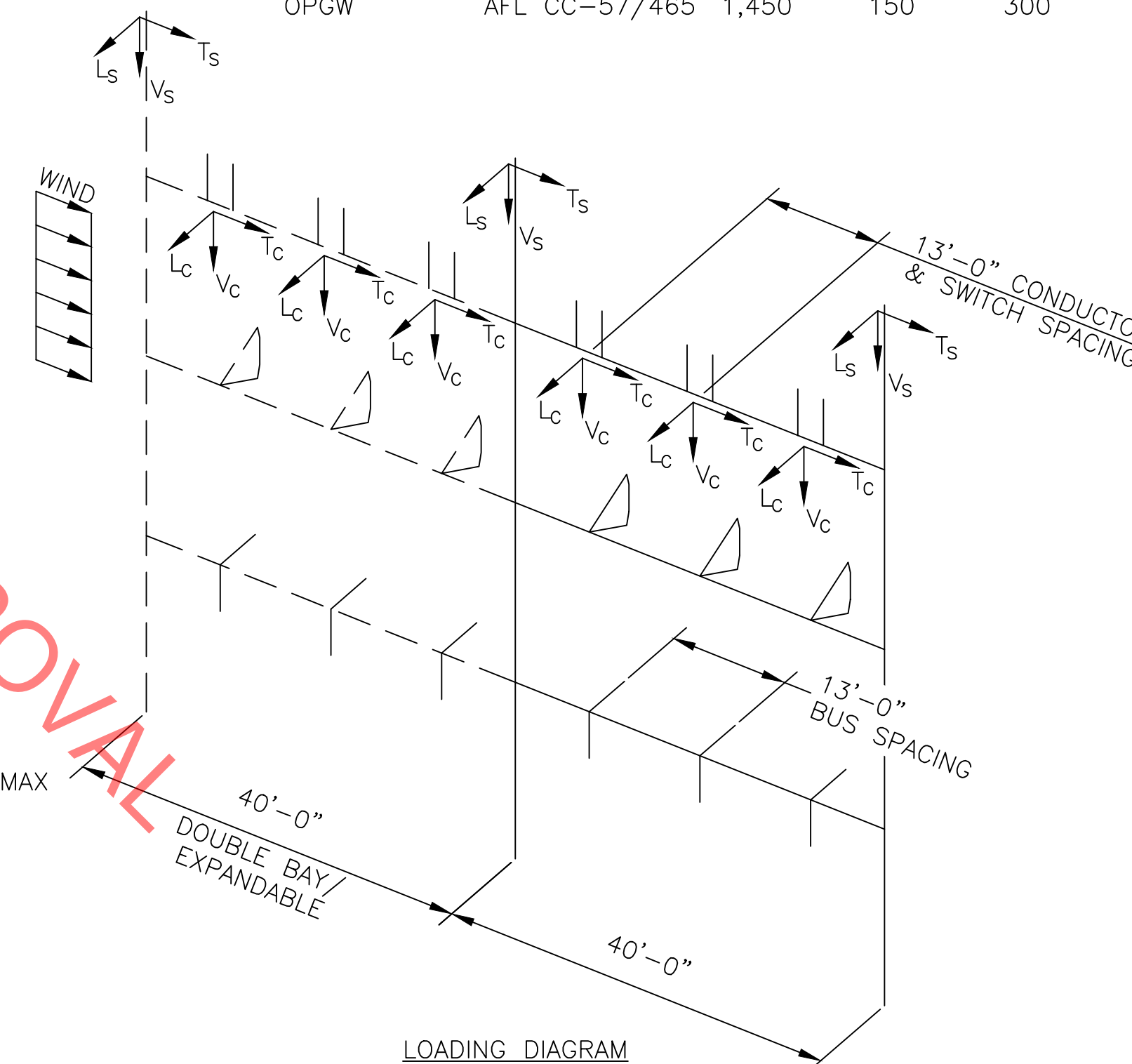
WIRE LOADS (0-15° LINE ANGLE):

H-FRAME STRUCTURES SHALL BE ANALYZED AND DESIGNED USING ULTIMATE STRENGTH DESIGN (USD) FOR THE FOLLOWING WIRE LOADS IN CONJUNCTION WITH THE STRUCTURE LOADS SHOWN ON DRAWING S907SPS00.

LOAD CASE		CONDUCTOR			OPGW			OVERLOAD FACTORS		
		(KIPS)			(KIPS)			WIND	VERTICAL	WIRE TENSION
		V _c	T _c	L _c	V _s	T _s	L _s			
CONDITION 1	NESC HEAVY	5.0	2.4	13.6	1.2	0.7	2.6	2.5	1.5	1.65
	EXTREME WIND	3.0	2.2	8.4	0.7	0.5	1.4	1.1	1.1	1.1
	EXTREME ICE	4.9	1.6	11.6	1.5	0.4	2.3	1.1	1.1	1.1
	ICE & WIND	4.9	2.0	11.8	1.5	0.7	2.5	1.0	1.0	1.0
	DEFLECTION	2.6	0.5	3.8	0.5	0.1	0.4	1.0	1.0	1.0
	CONSTRUCTION	5.7	1.7	0.5	1.6	0.7	0.2	1.0	1.0	1.0
CONDITION 2	NESC HEAVY	-1.1	1.7	6.6	0.3	0.7	2.4	2.5	1.5	1.65
	EXTREME WIND	-1.0	1.1	3.9	0.2	0.4	1.1	1.1	1.1	1.1
	EXTREME ICE	-1.2	1.2	5.9	0.4	0.6	2.3	1.1	1.1	1.1
	ICE & WIND	-1.3	1.4	6.1	0.4	0.7	2.4	1.0	1.0	1.0
	DEFLECTION	-0.3	0.4	1.9	0.1	0.1	0.3	1.0	1.0	1.0
	CONSTRUCTION	-0.6	0.7	3.0	0.1	0.2	0.6	1.0	1.0	1.0

1. FOR WIRE LOAD LOCATIONS, SEE LOADING DIAGRAM BELOW.
2. WIRE LOADS INCLUDE OVERLOAD FACTORS.

LOAD FACTORS.		MAX INITIAL TENSION	WIND SPAN	WEIGHT SPAN
DESCRIPTION	TYPE	(LBS)	(FT)	(FT)
CONDUCTOR	ACSR LAPWING	4,100	150	300
OPGW	AFL CC-57/465	1,450	150	300



DESIGN NOTES:

1. ALL LOAD CASES (EXCLUDING NESC HEAVY) SHALL USE THE FOLLOWING WIND DESIGN PARAMETERS:
- | | |
|-----------------|-----------------|
| EXPOSURE HEIGHT | 44 FT (2/3 x h) |
| EXPOSURE FACTOR | 1.065 |
2. ALL WIND LOADS SHALL BE MULTIPLIED BY THE FOLLOWING SHAPE FACTORS:
- | | |
|-----------------------------|-----|
| RIGID BUS/POST INSULATORS | 1.0 |
| ROUND SECTIONS | 0.9 |
| 12 OR 16 SIDED SECTIONS | 1.0 |
| 8 SIDED SECTIONS | 1.4 |
| SQUARE/RECTANGULAR SECTIONS | 2.0 |
3. ALL LOAD CASES (EXCLUDING NESC HEAVY) SHALL USE THE FOLLOWING ICE DESIGN PARAMETERS:
- | | |
|-----------------|-------|
| EXPOSURE FACTOR | 1.029 |
|-----------------|-------|
4. EQUIPMENT/INSULATOR WIND AREAS SHOWN INCLUDE SHAPE FACTORS AND SHOULD NOT BE MODIFIED.
5. DEFLECTIONS SHALL BE CALCULATED FOR ALL POINTS OF INTEREST, INCLUDING SWITCH TERMINAL PADS, HIGH POINTS OF RIGID BUS, CONDUCTOR ATTACHMENTS, AND WHERE OTHERWISE NOTED. DEFLECTION LIMITS FOR DEFLECTION LOAD CASES SHALL BE IN ACCORDANCE WITH THE FOLLOWING:
- i. HORIZONTAL DEFLECTION OF VERTICAL MEMBERS: 1/100 OF THE HEIGHT AT THE POINT OF INTEREST
 - ii. VERTICAL DEFLECTION OF HORIZONTAL MEMBERS: 1/200 OF THE HORIZONTAL SPAN
 - iii. HORIZONTAL DEFLECTION OF HORIZONTAL MEMBERS:
 - a. CLASS 'A' SWITCH SUPPORT MEMBERS: 1/200 OF THE HORIZONTAL SPAN
 - b. CLASS 'B' ALL OTHER SUPPORT MEMBERS: 1/100 OF THE HORIZONTAL SPAN
6. DEAD WEIGHT OF ALL HORIZONTAL RIGID BUS SHALL BE INCREASED BY 25% AS AN ALLOWANCE FOR CONTINUOUS LOOSE CABLE DAMPER.
7. ALL STRUCTURAL STEEL SHALL BE HOT-DIPPED GALVANIZED. ALL STRUCTURAL STEEL SHALL BE SUPPORTED ON LEVELING NUTS WITHOUT GROUT (DETAIL 3) AND ALL BASE PLATES AND ANCHOR BOLTS SHALL BE DESIGNED AND DETAILED ACCORDINGLY.
8. STRUCTURE DESIGN AND DETAILING SHALL INCLUDE SUPPORT PROVISIONS FOR SWITCH OPERATOR MECHANISMS AND PIPE.
9. SEE DRAWING S907SPS00 FOR ADDITIONAL LOADING INFORMATION.

**BURNS
MCDONNELL**
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GRAND RIVER DAM AUTHORITY			
3500 MAIN SUBSTATION		S907	
PRYOR, OKLAHOMA			
161KV			
161KV SUBSTATION			
DBLE BAY/EXPANDABLE 65' H-FRAME STR			
SCALE: NTS	DRAWN BY: JM	ENGR: JM	APPD: RG
 P.O. BOX 409 VINITA, OK 74301		CH: TL	DATE: 09/28/2018
		DRAWING No.	
		S907SPS08	
		REV.	A