

BILL OF MATERIAL				ASSEMBLY NO.
QTY	DESCRIPTION	MATERIAL	UNIT	81018136
<b>BOOM RIGGING B80:680-681-682</b>				
1	POINT ASSY EXT UPPER #58WA		81009978	20
2	BUTT ASSY #680, 6.0M		81020303	2
3	INSERT ASSY #680, 4.00M		81020306	3
4	INSERT ASSY #680/681, 12.00M		81021310	4
5	TRANSITION INSERT ASSY #681/682, 6M		81021714	5
6	INSERT ASSY #680 12M W/SHV		81021996	6
7	INSERT ASSY 680 12M HV W/EQ		81022604	7
8	TOP ASSY #682 1 METER CAP		81026272	8
9	INSERT ASSY #680, 12.00M X-HEAVY		81034977	9
10				
NO. REQ'D FOR THE FOLLOWING ITEMS ARE IN THE BOOM LENGTH TABLE				
100	INSERT ASSY #680, 12.00M HEAVY		81020424	10
101	INSERT ASSY #680, 6.00M HEAVY		81020427	11
102	INSERT ASSY #682, 12.00M		81021198	12
103	INSERT ASSY #681, 6M		81021204	13
104	INSERT ASSY #680, 12.00M MEDIUM		81021299	14
105	INSERT ASSY #681, 3.00M		81022004	15
106	INSERT ASSY #682, 12M STRUT		81032715	16
107	INSERT ASSY #681, 12.00M		81034541	17
108	INSERT ASSY #680, 12.00M W/SUSP		81035136	18
109	GUIDE ASSY - WIRE ROPE		84022926	
<b>OPTION 1: HOOK BLOCKS</b>				
200	BLOCK HOOK 135MT 32WR 3SH		81023461	19
201	BLOCK HOOK 100MT 28WR 3SH		81031987	19
202	WEIGHT BALL SWIVEL 22.2MT, 28MM & 32MM WR		81033344	19
203	HOOK BLOCK 160MT 35H 32WR		84039500	19
<b>BASIC REFERENCE ITEMS</b>				
R1	PIN COTTER 3/16 DIA X 2.00 LG		562087	
R2	LINK CONNECTING MACHINING		84022978	33
R3	ROPE GUIDE #682 1 METER CAP		84046945	
R4				
R5	LINK #680 BOOM STRAP		81025610	
R6				
R7	PIN SAFETY .250 DIA X 5.20 LG		81027802	
R8	PIN 2 HOLE 110.3 DIA X 242.9 LG		84036353	
R9				
R10	MAST ASSEMBLY		81025005	37
R11	EQUALIZER ASSY		81027149	
R12	LINK #680, 4M INSERT		81027236	
R13	STRAP 12M #680 W/EQUALIZER		81027608	
R14	PIN 1 HOLE W/HD 127.3 DIA X 122.5 LG		81027653	
R15	MAST ASSEMBLY		84050187	37
R16	PIN 1 HOLE W/HD 105.0 DIA X 121.1 LG		81028258	
R17	PIN 1 HOLE W/HD 127.0 DIA X 121.1 LG		81028259	
R18	COLLAR 106.5 MM I.D.		81028260	
R19	PIN 2 HOLE 19.05 DIA X 142.0 LG		81028262	
R20	COLLAR 128.2 MM I.D.		81028264	
R21	PIN 2 HOLE 19.05 DIA X 167.8 LG		81028265	
R22	LOAD CELL LINK 25,000 KGS		81030836	28
R23				
R24	BOOM POINT LOWER ASSY 2 SHEAVES		81030118	26
R25	STRAP 12M #680/681		81030485	
R26	STRAP 12M #680/681		81030486	
R27	STRAP 6M #681/682 TRNSN		81030487	
R28				
R29	LINK ASSY DEAD END		81042356	28
R30	LINK ASSY LOAD		84047539	
R31	ESI POSITION LIGHT AND ANEMOMETER		81031642	34
R32	LINK #682 BOOM STRAP		81042554	
R33	LINK #680 EQ TO STRAP		81042617	
R34	PIN 2 HOLE 22.2 DIA X 152.0 LG		A15390	
R35	COLLAR 128.0 I.D.		A15391	
R36				
NO. REQ'D FOR THE FOLLOWING REFERENCE ITEMS ARE IN THE BOOM LENGTH TABLE (SHEET 2)				
R100	PIN COTTER 1/4 DIA X 1.50 LG		562105	
R101	STRAP 12M #680, 681, 682		81020475	
R102	LINK #680 BOOM		81020476	
R103	PIN 1 HOLE W/HD 79.3 DIA X 121.1 LG		81020477	
R104	COLLAR 80.2MM I.D.		81020478	
R105	STRAP 6M #680		81021271	
R106	STRAP 3M #680		81022552	
R107	STRAP 12M #682 W/STRUT		81038947	
R108	STRAP 12M #682, 50.8X88.0		81040347	
R109	LINK CONNECTING #680 12.00M W/STRUT		81028261	
R110	STRAP 12M #680 W/STRUT		81028322	
R111	STRAP 12M #680 W/STRUT		81028323	
R112	SUSPENDER WIRE ROPE #680		81036355	31
R113	PIN 2 HOLE 19.05 DIA X 117.0 LG		A16804	
R114				
<b>REFERENCE ITEMS FOR ASSEMBLY AND RIGGING PURPOSE ONLY</b>				
R200				
R201				
R202				
R203	PIN PULLER BOOM BUTT CAGE WELD		81030540	32
R204	PIN PULLER ASSY HAND HELD		81030756	32
R205	SLING LIFTING 100,000 LBSX10.83 FT		81038731	32
R206				
R207				
R208	SLING LIFTING 25,000(LBS)X12.5(FT)		81040162	32
R209	SLING 70000 LBS 16.4 FT		81042116	32
R210				
<b>REFERENCE OPTION 3: EUBP DEAD END</b>				
R300	LINK ASSY DEAD END		81042356	28

- 1 REQ'D FOR LUFFING JIB. LUFFING JIB WIRE ROPE GUIDES ON 12M XH INSERT MAY REMAIN IN PLACE WITH BOOM ONLY MAKEUP. LUFFING DRUM IN BOOM BUTT MAY REMAIN IN PLACE WITH BOOM ONLY MAKEUP. ITEMS MAY BE IN OPERATING OR SHIPPING POSITION.
- 2 BUTT 6.0M I.D. TAG #81020304
- 3 INSERT 4.00M X-HEAVY I.D. TAG #81020307. SEE DELTA NOTE 38 ON SHEET 2.
- 4 INSERT 12.00M I.D. TAG #81021311. SEE DELTA NOTE 38 ON SHEET 2.
- 5 INSERT TRANSITION 6.00M I.D. TAG #81021715. SEE DELTA NOTE 38 ON SHEET 2.
- 6 INSERT 12.00M X-HEAVY W/SHEAVES I.D. TAG #81021997
- 7 INSERT 12.00M HEAVY W/EQUALIZER I.D. TAG #81022605. SEE DELTA NOTE 38 ON SHEET 2.
- 8 TOP 1.00M CAP I.D. TAG #81026275. SEE DELTA NOTE 38 ON SHEET 2.
- 9 INSERT 12.00M X-HEAVY I.D. TAG #81034978. SEE DELTA NOTE 38 ON SHEET 2.
- 10 INSERT 12.00M HEAVY I.D. TAG #81020425. SEE DELTA NOTES 38 & 39 ON SHEET 2.
- 11 INSERT 6.00M HEAVY I.D. TAG #81020428. SEE DELTA NOTE 38 ON SHEET 2.
- 12 INSERT 12.00M I.D. TAG #81021199. SEE DELTA NOTE 38 ON SHEET 2.
- 13 INSERT 6.00M I.D. TAG #81021205. SEE DELTA NOTE 38 ON SHEET 2.
- 14 INSERT 12.00M MEDIUM I.D. TAG #81021300. SEE DELTA NOTE 38 ON SHEET 2.
- 15 INSERT 3.00M I.D. TAG #81022005. SEE DELTA NOTE 38 ON SHEET 2.
- 16 INSERT 12.00M W/SUSPENSION I.D. TAG #81032716. SEE DELTA NOTE 38 ON SHEET 2.
- 17 INSERT 12.00M I.D. TAG #81034543. SEE DELTA NOTE 38 ON SHEET 2.
- 18 INSERT 12.00M MEDIUM W/SUSPENSION I.D. TAG #81035137. SEE DELTA NOTE 38 ON SHEET 2.
- 19 MAY BE USED AT 2 SHEAVE LOWER BOOM POINT ON ITEM 8 TOP ASSY 81026272.
- 20 POINT EXT UPPER I.D. TAG #81009979
- 21 EQUALIZER SPACER LINKS TO BE IN STOWAGE POSITION (SEE VIEW M-M ON SHEET 7)
- 22 FOR BOOM STRAP COMPONENTS ON OPTIONAL INSERT REFER TO BOOM LENGTH TABLE ON SHEET 2.
- 23 BOOM STRAPS/LINKS MUST BE REMOVED FROM INSERT PRIOR TO OPERATION.
- 24 BOOM STRAPS/LINKS MAY REMAIN ON INSERT DURING OPERATION.
- 25 REFER TO CAPACITY CHART IF JIB BACKSTAY STRAPS AND LINKS REMAIN ON BOOM ASSY. (SEE VIEW E-E ON SHEET 2)
- 26 CALLED FOR ON TOP ASSY ITEM 8 AS OPTION 1 EQUIPPED. FOR SHEAVE CONFIGURATION REFER TO SHEET 10.
- 27
- 28 REFER TO SHEET 10 FOR COMPONENT CONFIGURATION. STOWS IN PARTS BOX 81028467.
- 29 SEE BLOCK REEVING DIAGRAM 81042787 FOR RIGGING CONFIGURATION OPTIONS AND INSTRUCTIONS. SEE RIGGING WINCH ASSY 81026267 FOR BLOCK AND WIRE ROPE ASSEMBLY.
- 30 PIN 81032548 AS SHOWN IN VIEW K-K ON SHEET 7 NOT REQUIRED FOR BOOM. ONLY USED FOR "IN AIR" ASSEMBLY OF LUFFING JIB INSERTS #681 OR #682.
- 31 110.0M (390.9 FT) THRU 152.0M (498.7 FT) BOOM REQUIRES INTERMEDIATE SUSPENSION ITEM R112. ITEM R112 IS OPTION 3 IN ITEM 108. 81035136. REFER TO BOOM LENGTH TABLE (SHEET 2) FOR SUSPENSION BUTT NUMBER. SEE SHEET 11 FOR OPERATIONAL INSTRUCTIONS.

(DELTA NOTES CONTINUE ON SHEET 2)

BOOM HOIST REEVING DIAGRAM FOR 16 PART LINE FOR REFERENCE ONLY

92.0 M (301.8 FT)  
#680-681-682 BOOM SHOWN



ITEMS REQ'D FOR VARIOUS BOOM LENGTHS - SEE SHEETS 3, 4, 5, & 6 FOR BOOM MAKE-UP

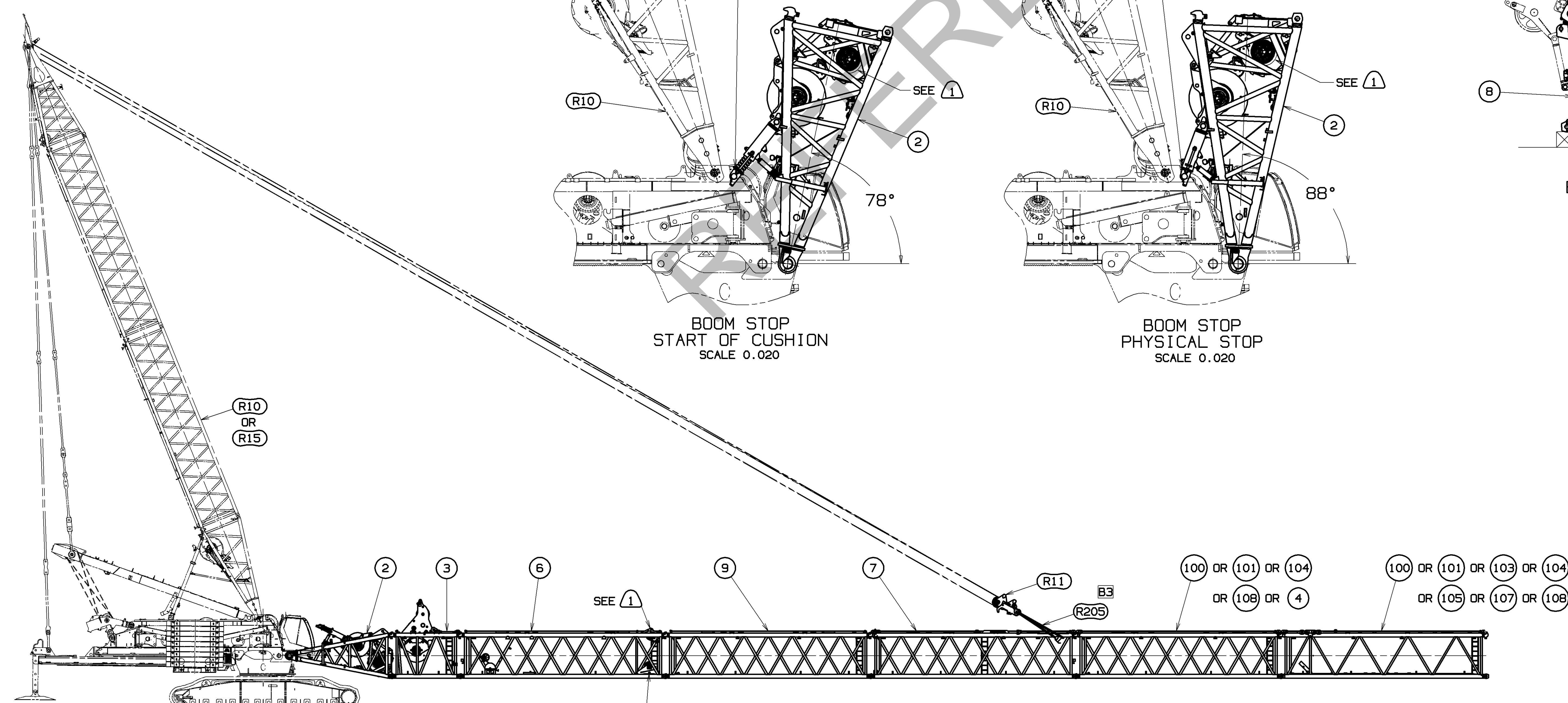
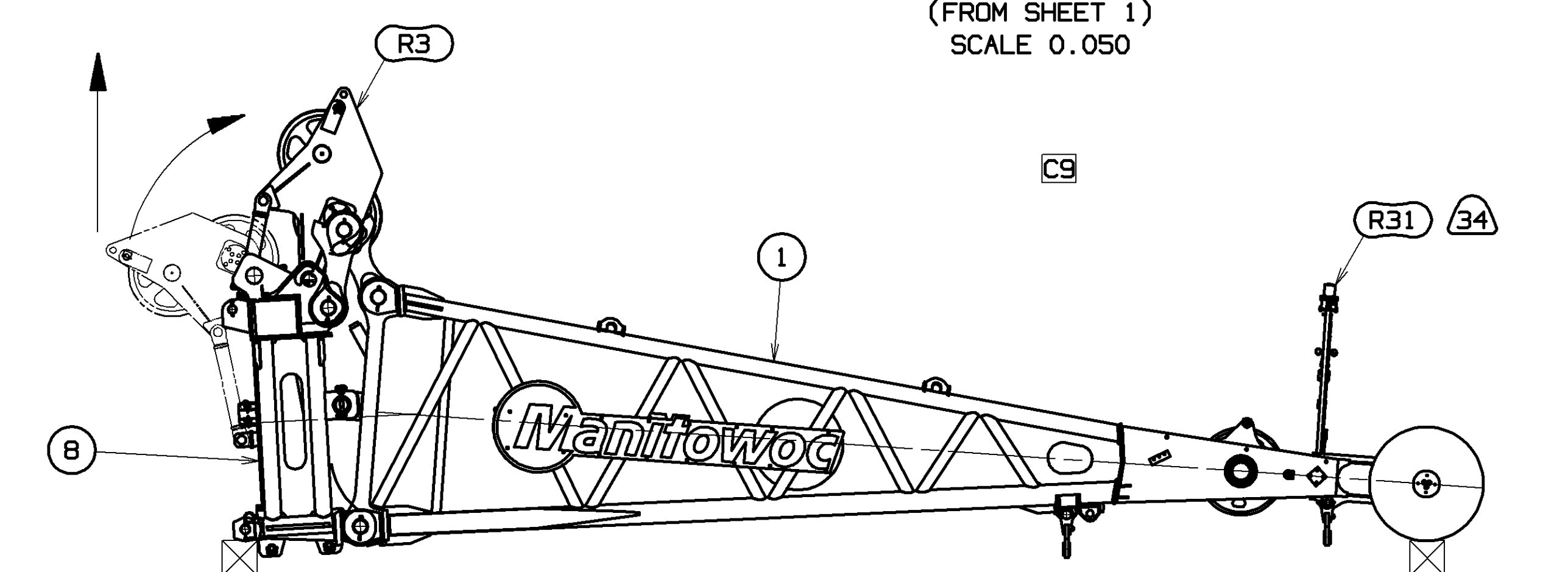
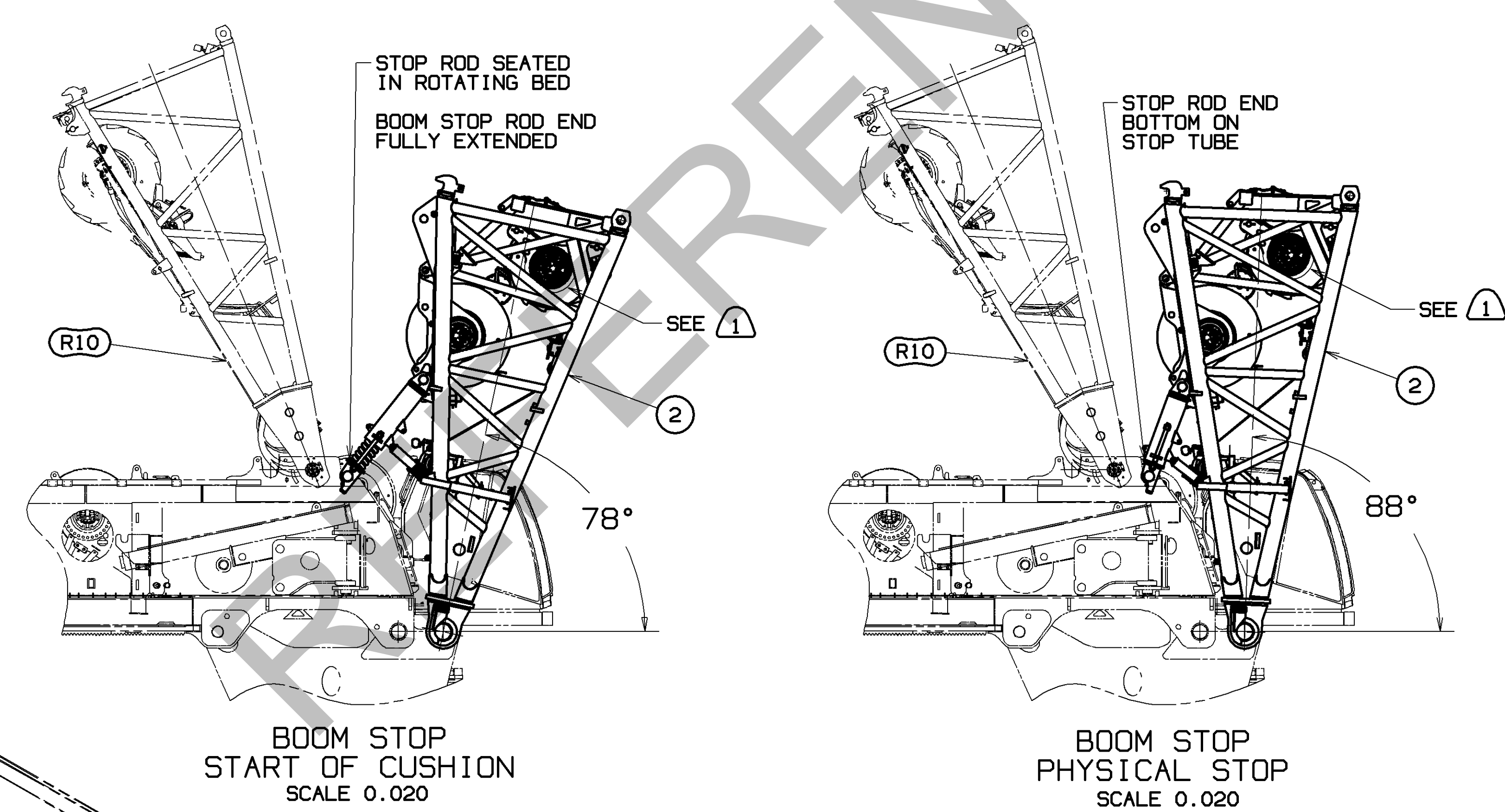
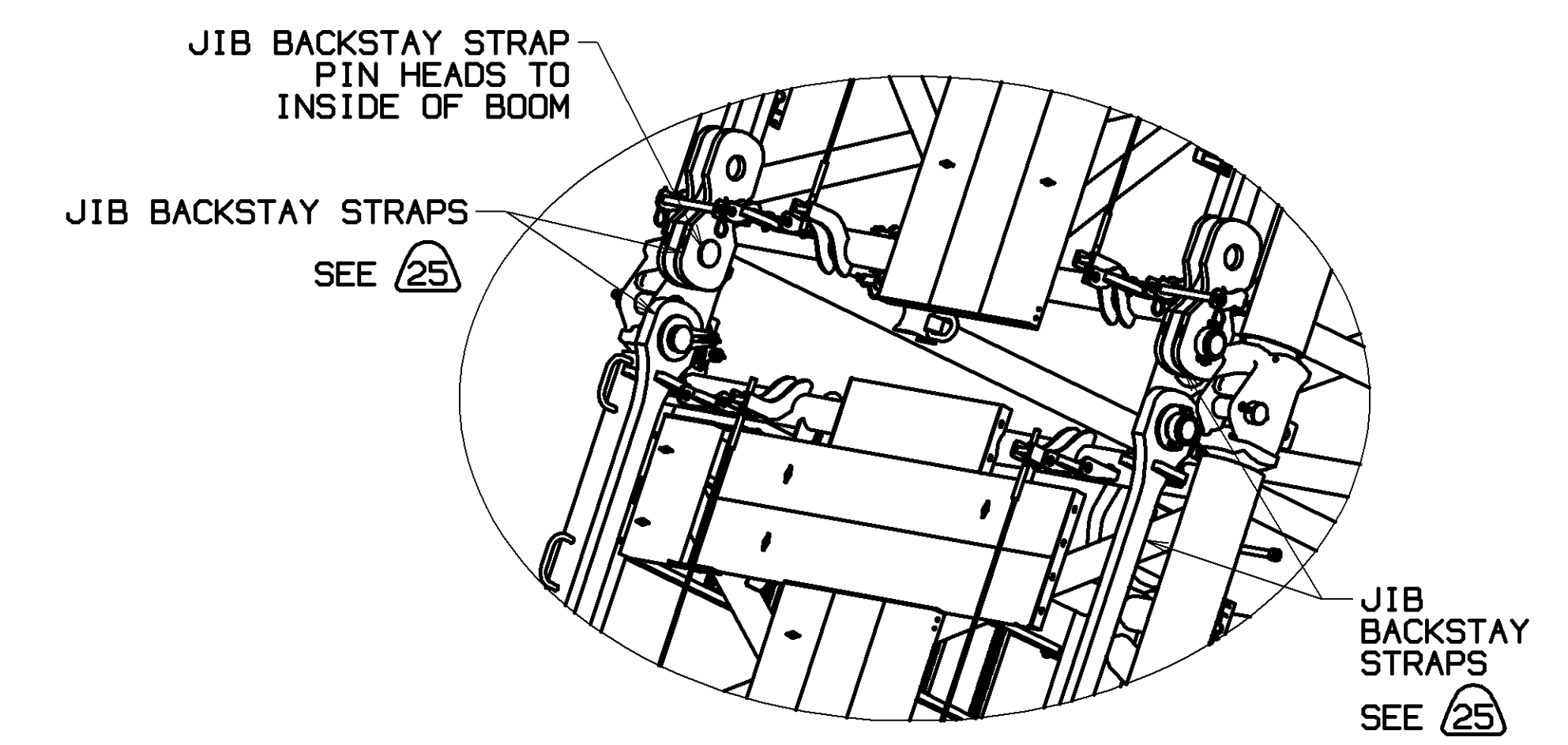
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BILL OF MATERIAL		ASSEMBLY USED ON
QTY	DESCRIPTION	MATERIAL

ITEM NO.	#680 INSERTS				#681 INSERTS				#682 INSERT		STRAP						LINK		PIN		COTTER	COLLAR	SUSPENSION	GUIDE	
	100	101	104	108	107	103	105	102	106	R101	R105	R106	R107	R108	R110	R111	R102	R109	R103	R113	R100	R104	108 (36)	109	
BOOM LENGTH	INSERT 12M (39.4FT) ASSY	INSERT 6M (19.7FT) ASSY	INSERT 12M (39.4FT) ASSY	INSERT 12M (39.4FT) SUSP ASSY	INSERT 12M (39.4FT) ASSY	INSERT 6M (19.7FT) ASSY	INSERT 3M (9.8FT) ASSY	INSERT 12M (39.4FT) ASSY	INSERT 12M (39.4FT) SUSP ASSY	STRAP 12M (39.4FT)	STRAP 6M (19.7FT)	STRAP 3M (9.8FT)	STRAP LONG #682 W/SUSP	STRAP SHORT #682 W/SUSP	STRAP SHORT #680 W/SUSP	STRAP LONG #680 W/SUSP	LINK	LINK CONNECT W/SUSP	PIN	PIN	COTTER	COLLAR	PENDANT BUTTON NUMBER SEE (31)	WIRE ROPE GUIDE UPPER	
92	301.8	1	0	OR 0	1	0	0	1	0	0	2	0	0	0	2	2	28	2	40	40	92	40	-	0	
98	321.5	1	0	OR 0	1	0	1	1	0	0	2	2	0	0	2	2	32	2	44	44	100	44	-	0	
104	341.2	1	0	OR 0	1	1	0	1	0	0	4	0	0	0	2	2	32	2	44	44	100	44	-	0	
110	360.9	2	1	0	1	0	0	1	0	0	4	2	0	0	2	2	36	2	48	48	108	48	9	1	
113	370.7	2	1	0	1	0	1	0	0	0	4	4	0	0	2	2	36	2	48	48	108	48	9	1	
116	380.6	2	1	0	1	0	1	1	0	0	4	4	2	0	0	2	2	40	2	52	52	116	52	9	1
119	390.4	2	1	0	1	1	0	0	0	0	6	2	0	0	2	2	36	2	48	48	108	48	9	1	
122	400.3	2	1	0	1	1	0	1	0	0	6	2	0	0	2	2	40	2	52	52	116	52	9	1	
125	410.1	2	1	0	1	1	1	0	0	0	6	4	0	0	2	2	40	2	52	52	116	52	9	1	
128	419.9	3	1	0	1	0	1	1	0	0	6	4	2	0	0	2	2	44	2	56	56	124	56	8	1
131	429.8	3	1	0	1	1	0	0	0	0	8	2	0	0	0	2	2	40	2	52	52	116	52	8	1
134	439.6	3	1	0	1	1	0	1	0	0	8	2	2	0	0	2	2	44	2	56	56	124	56	8	1
137	449.5	3	1	0	1	1	1	0	0	0	8	4	0	0	2	2	44	2	56	56	124	56	8	1	
140	459.3	3	1	0	1	1	1	1	0	0	8	4	2	0	0	2	2	48	2	60	60	132	60	8	1
143	469.2	3	1	0	1	1	0	0	OR 0	1	8	2	0	2	2	48	2	60	60	132	60	8	1		
146	479.0	3	1	0	1	1	0	1	OR 0	1	8	2	2	2	2	52	2	64	64	140	64	8	1		
149	488.8	3	1	0	1	1	1	0	OR 0	1	8	4	0	2	2	52	2	64	64	140	64	8	1		
152	498.7	3	1	0	1	1	1	1	OR 0	1	8	4	2	2	2	56	2	68	68	148	68	8	1		

(DELTA NOTES CONTINUED FROM SHEET 1)

- (32) STOWS IN PARTS BOX 81028467.
- (33) CALLED FOR ON EXTENDED UPPER POINT ITEM 1 AS OPTION 12 EQUIPPED. LINK R2 CAN BE USED FOR 35° OR 41° OFFSET. (SEE DETAIL T ON SHEET 10).
- (34) RELOCATE FROM MAIN BOOM. (STOWS ON INSERT ITEM 6).
- (35) INTERMEDIATE BLOCKING IS REQUIRED FOR BOOM LENGTHS 131.0 M (429.8 FT) THROUGH 152.0 M (498.7 FT). DISTANCE BETWEEN BOOM SUPPORT LOCATIONS IS NOT TO EXCEED 60.0 M (196.9 FT) (SEE INTERMEDIATE BLOCKING VIEW ON SHEET 8).
- (36) SUSPENSION PENDANT MAY APPEAR SLACK DURING RAISING AND OPERATION. CHECK SUSPENSION LOCATION AND PENDANT BUTTON NUMBER AND CONTINUE OPERATION.
- (37) MAST RIGGING M10:684 (R10) CONTAINS MAST BUTT ASSY 81025360 WITH "PASSIVE" FIXED MAST STOP. MAST RIGGING M11:684 (R15) CONTAINS MAST BUTT ASSY 84041644 WITH "ACTIVE" FIXED MAST STOP.
- (38) IF EQUIPPED WITH LOWER BOOM CONNECTOR PIN COMPONENTS USED WITH HAND HELD CYLINDER (R204) 81030756, SEE DETAIL N ON SHEET 8. IF EQUIPPED WITH MANUAL LOWER BOOM CONNECTOR PIN (R8), SEE DETAIL DD ON SHEET 8.
- (39) MANUAL LOWER CONNECTOR PIN (R8) INSTALLATION REQUIRED FOR APPROVED BOOM ASSEMBLY AT JOINTS INDICATED ON BOOM MAKEUPS (SHEETS 3, 4, & 5). SEE DETAIL EE ON SHEET 9.



BOOM HANDLING WITH EQUALIZER									
WITH EQUALIZER ATTACHED TO BOOM INSERTS MAXIMUM BOOM THAT CAN BE CANTILEVERED BEYOND 12M EQUALIZER INSERT IS AS FOLLOWS.									
LENGTH	3M (9.8FT) 81022004	6M (19.7FT) 81021204	6M (19.7FT) 81021714	12M (39.4FT) 81034541	12M (39.4FT) 81021310	12M (39.4FT) 81020424	6M (19.7FT) 81020427	12M (39.4FT) 81021259	12M (39.4FT) 81035136
6M (19.7FT)	0	0	0	0	0	0	1	0	0
12M (39.4FT)	OR 0	0	0	0	0	1	0	0	0
15M (49.2FT)	1	0	0	0	1	0	0	0	0
18M (59.1FT)	OR 0	1	0	0	1	0	0	0	0
21M (68.9FT)	OR 0	0	0	0	0	1	1	0	0
24M (78.7FT)	OR 0	0	0	0	0	1	0	0	0
	OR 0	0	0	0	1	0	0	0	0
	OR 0	0	0	0	1	0	0	0	1
	OR 0	0	0	0	1	0	0	1	0
	OR 0	0	0	0	0	1	0	1	0
	OR 0	0	0	0	0	1	0	0	1
	OR 0	0	0	0	0	2	0	0	0

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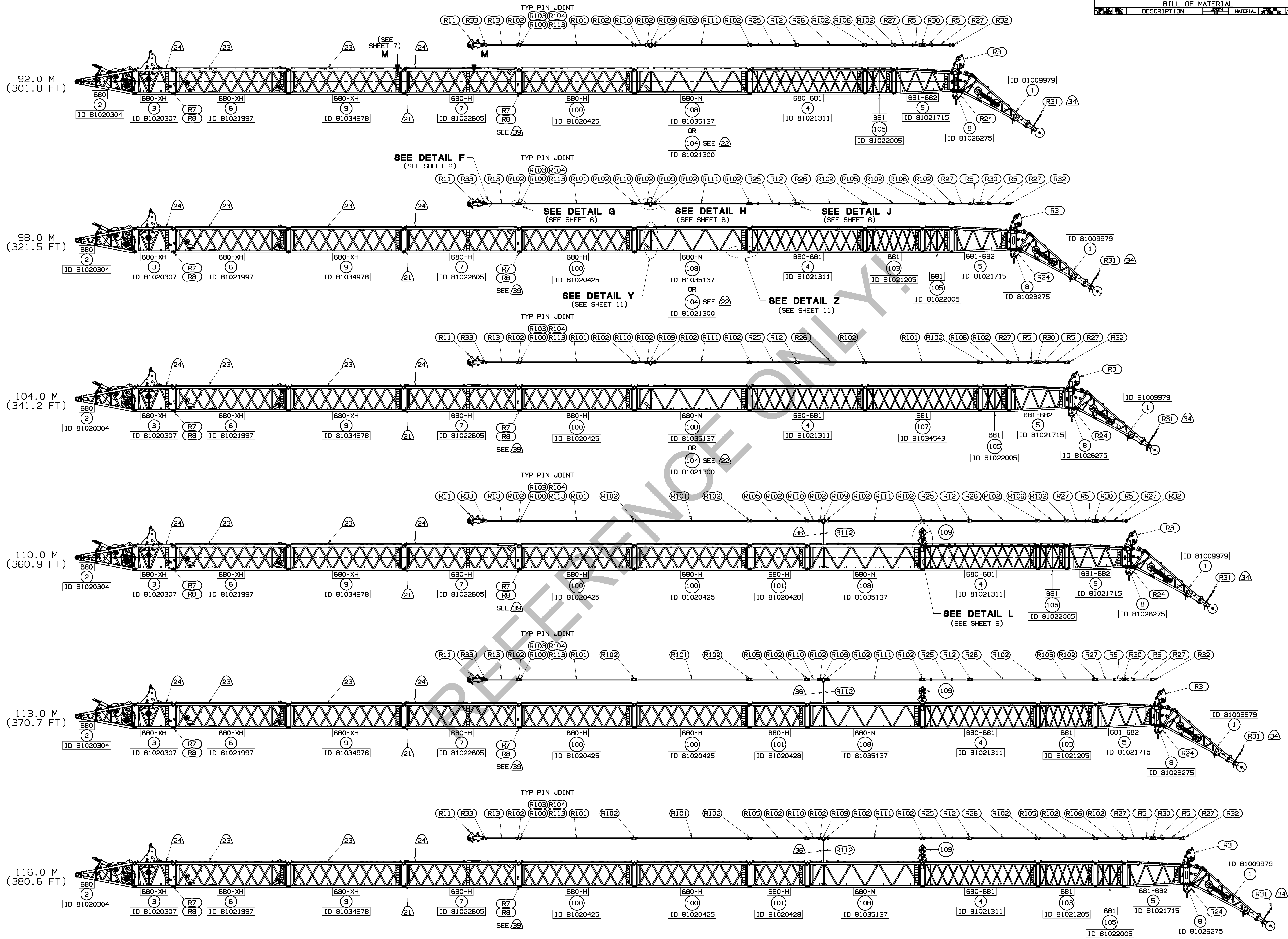
TOLERANCE UNLESS OTHERWISE SPECIFIED	FABRICATION	FINISHING
DECIMAL PLACES	F. 10 FEET > 10 FEET	W. 10 FEET > 10 FEET
(1) PLACE 0.0	+0.12	+0.18
(2) PLACE 0.00	+0.08	+0.12
(3) PLACE 0.000	+0.05	+0.08
ANGLES	+1.30	+1.30

MANITOWOC CRANES, INC.	BOOM RIGGING
MANITOWOC, WISCONSIN	B80:680-681-682
MODEL:MLC650	
DATE: 03-16-16	

81022864  
SHT 2 OF 11



BILL OF MATERIAL		ASSEMBLED USED IN
QTY	DESCRIPTION	MATERIAL



RECOMMENDED BOOM MAKEUP  
 FOR TYP PIN JOINT SEE SECTIONS B-B & D-D,  
 AND DETAILS F, G, H & J

TOLERANCE UNLESS OTHERWISE SPECIFIED		MATERIAL		FINISHING		PAINTING		MARKING	
DECIMAL PLACES	F. TO FEET	IO FEET	IO FEET	FINISHING	PAINTING	MARKING	MARKING	MARKING	MARKING
(1) PLACE 0.0	±.12	±.18	±.03	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC
(2) PLACE 0.00	±.08	±.12	±.015	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC
(3) PLACE 0.000	±.008	±.012	±.006	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC	AS PER SPEC
ANGLES	±1.30°								

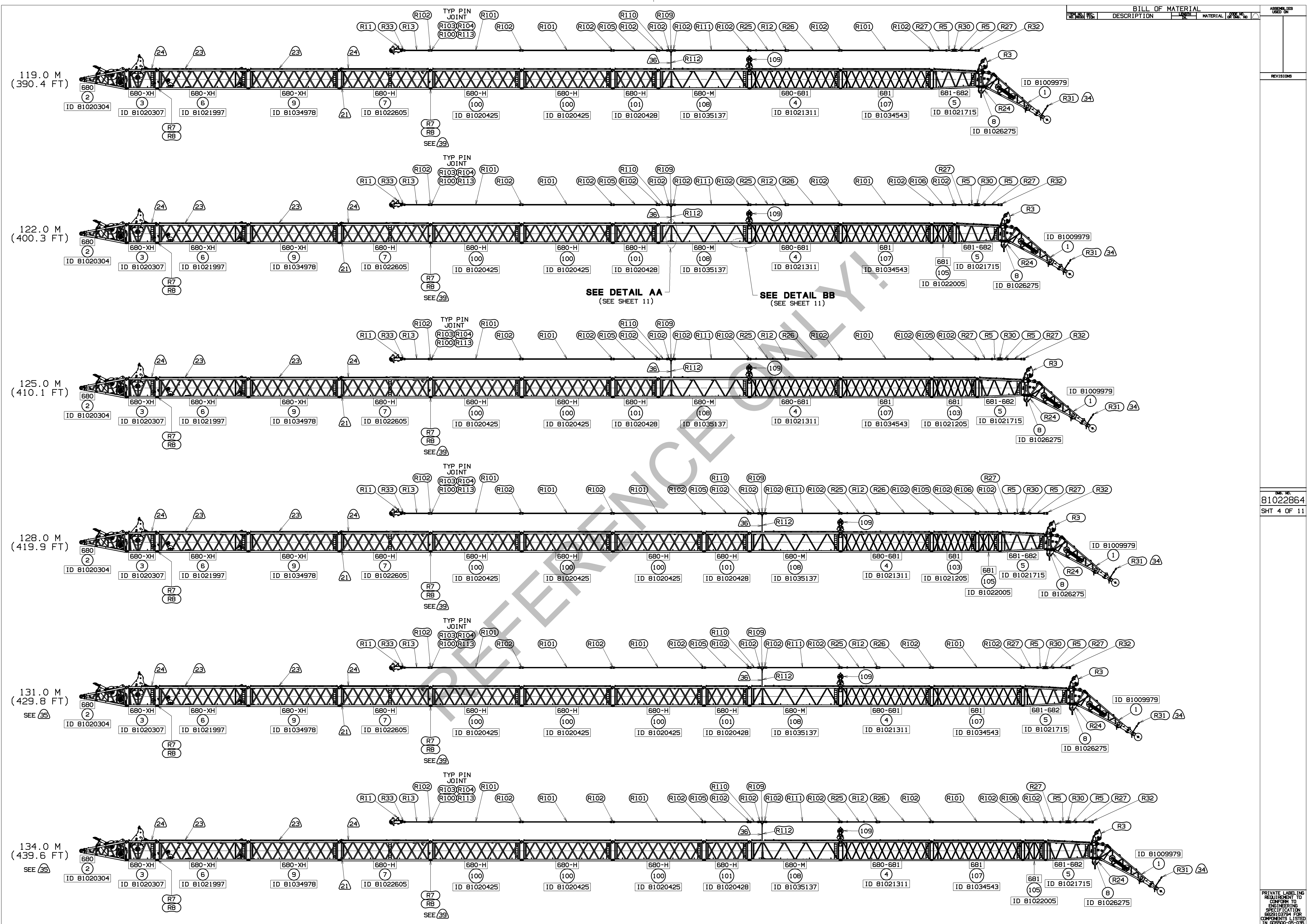
PRIVATE LABELING  
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 CONFORM TO  
 SPECIFICATION  
 6829103794 FOR  
 COMPONENTS LISTED  
 IN SECTION 03-02  
 DATE  
 03-16-16  
 REV. LTR.  
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81022864  
 SHT 3 OF 11

81022864  
 SHT 3 OF 11



BILL OF MATERIAL			
QTY	DESCRIPTION	MATERIAL	REF. NO.



SEE DETAIL AA (SEE SHEET 11)      SEE DETAIL BB (SEE SHEET 11)

RECOMMENDED BOOM MAKEUP  
FOR TYP PIN JOINT SEE SECTIONS B-B & D-D  
AND DETAILS F,G,H & J

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	<small>DATE</small> 03-16-16			
	<small>REV. LTR.</small> D			

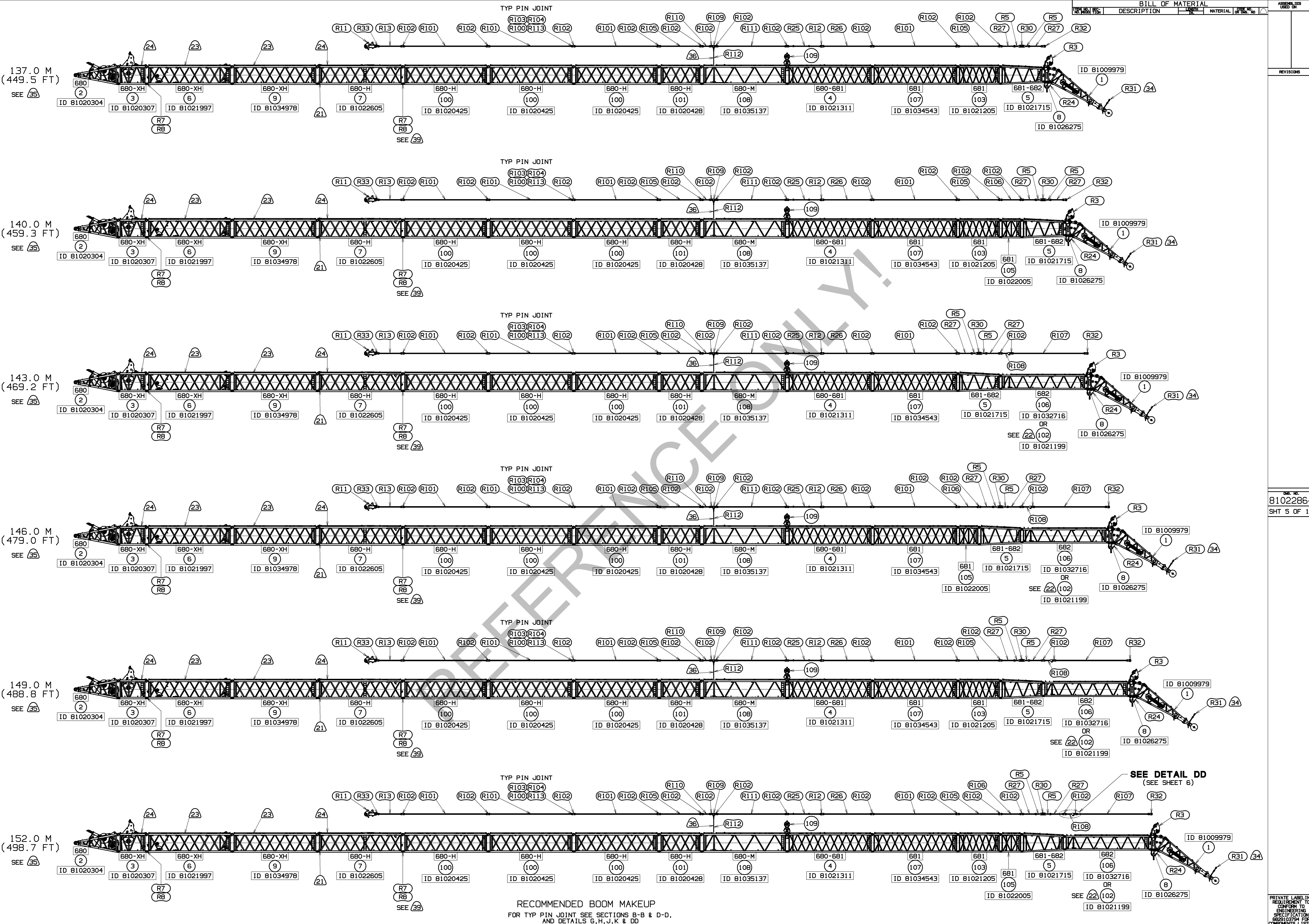
ASSEMBLIES USED IN

REVISIONS

81022864  
SHT 4 OF 11

81022864  
SHT 4 OF 11





BILL OF MATERIAL		ASSEMBLY USED IN
QTY	DESCRIPTION	MATERIAL

81022864  
SHT 5 OF 11

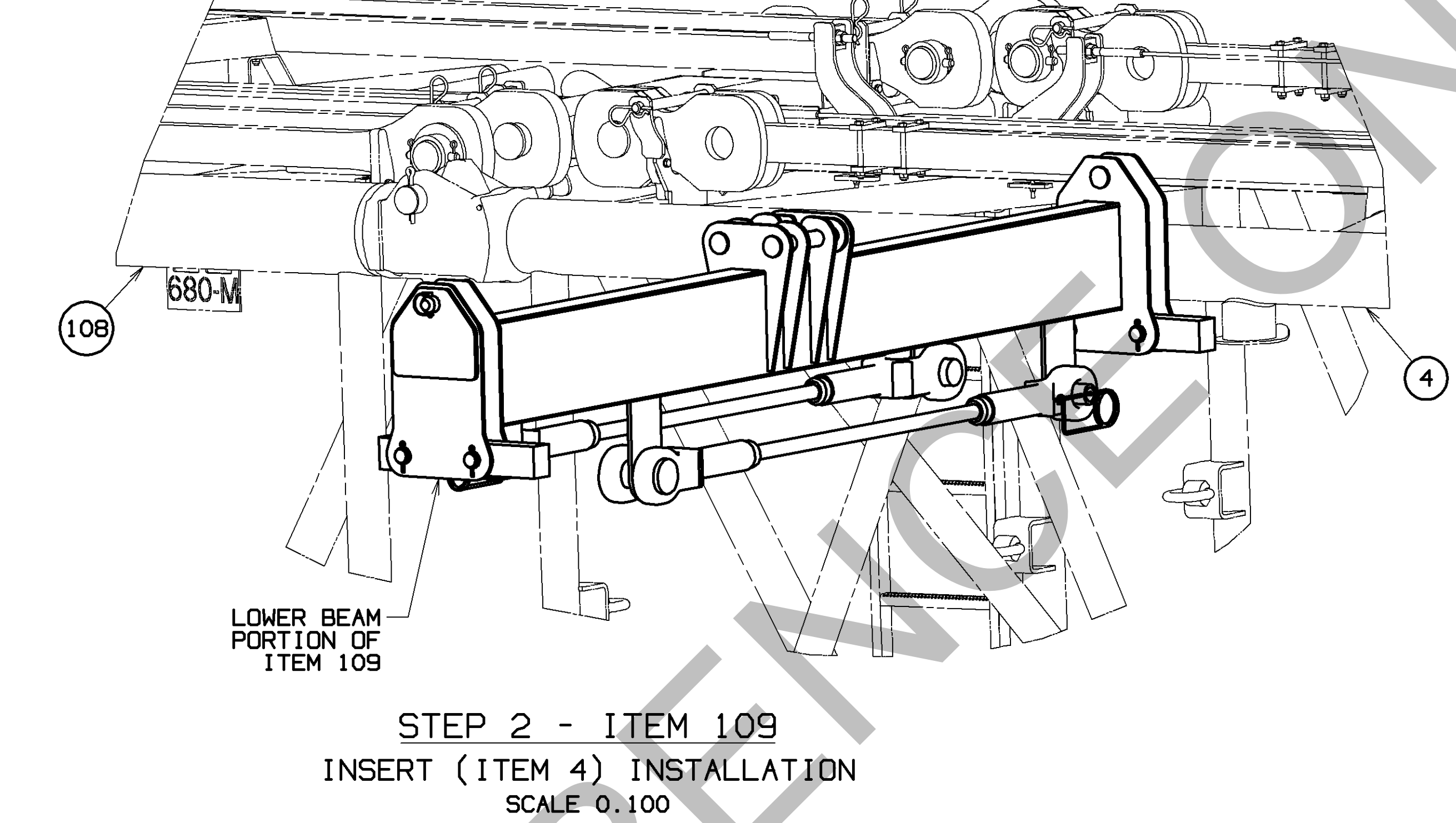
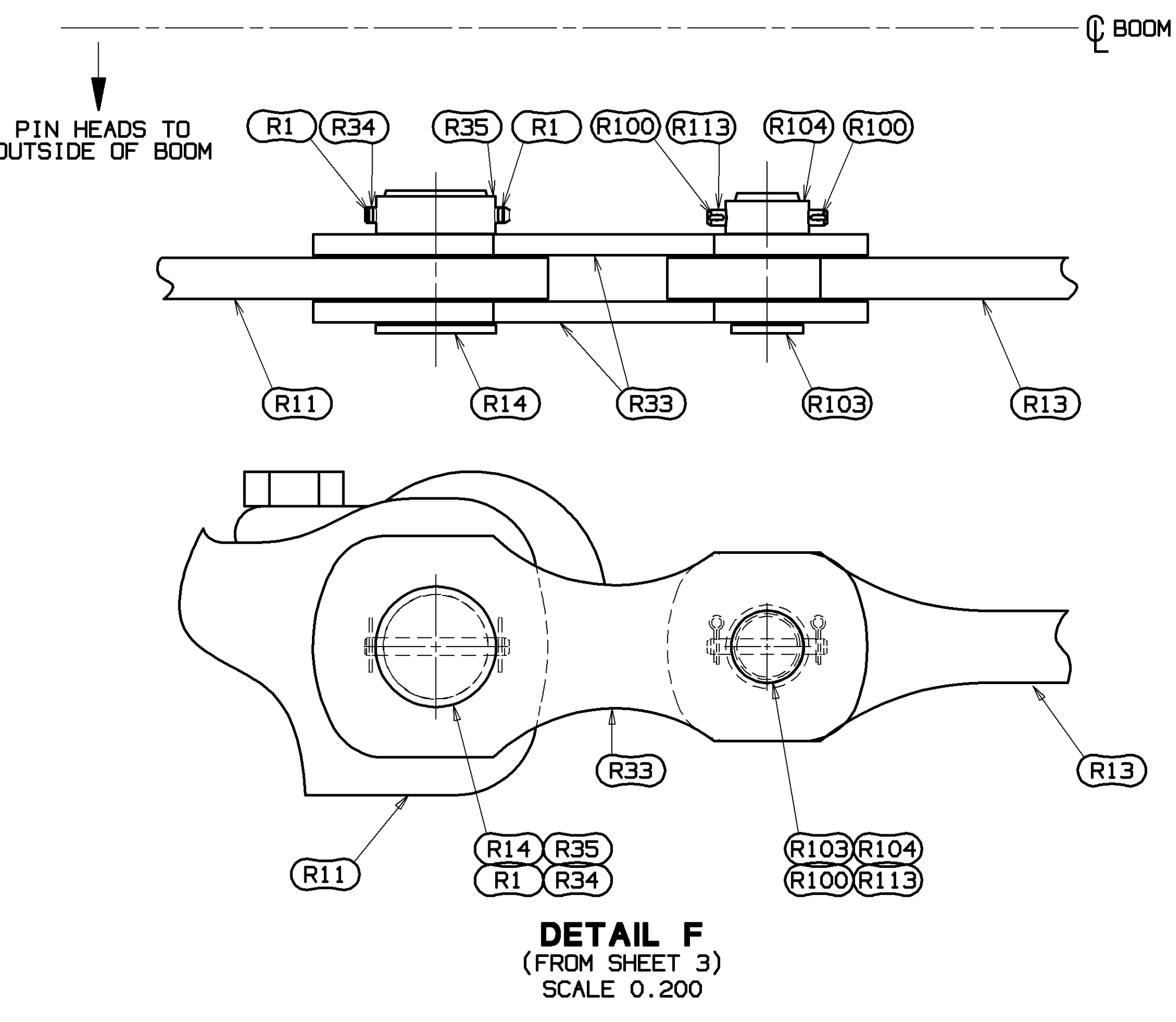
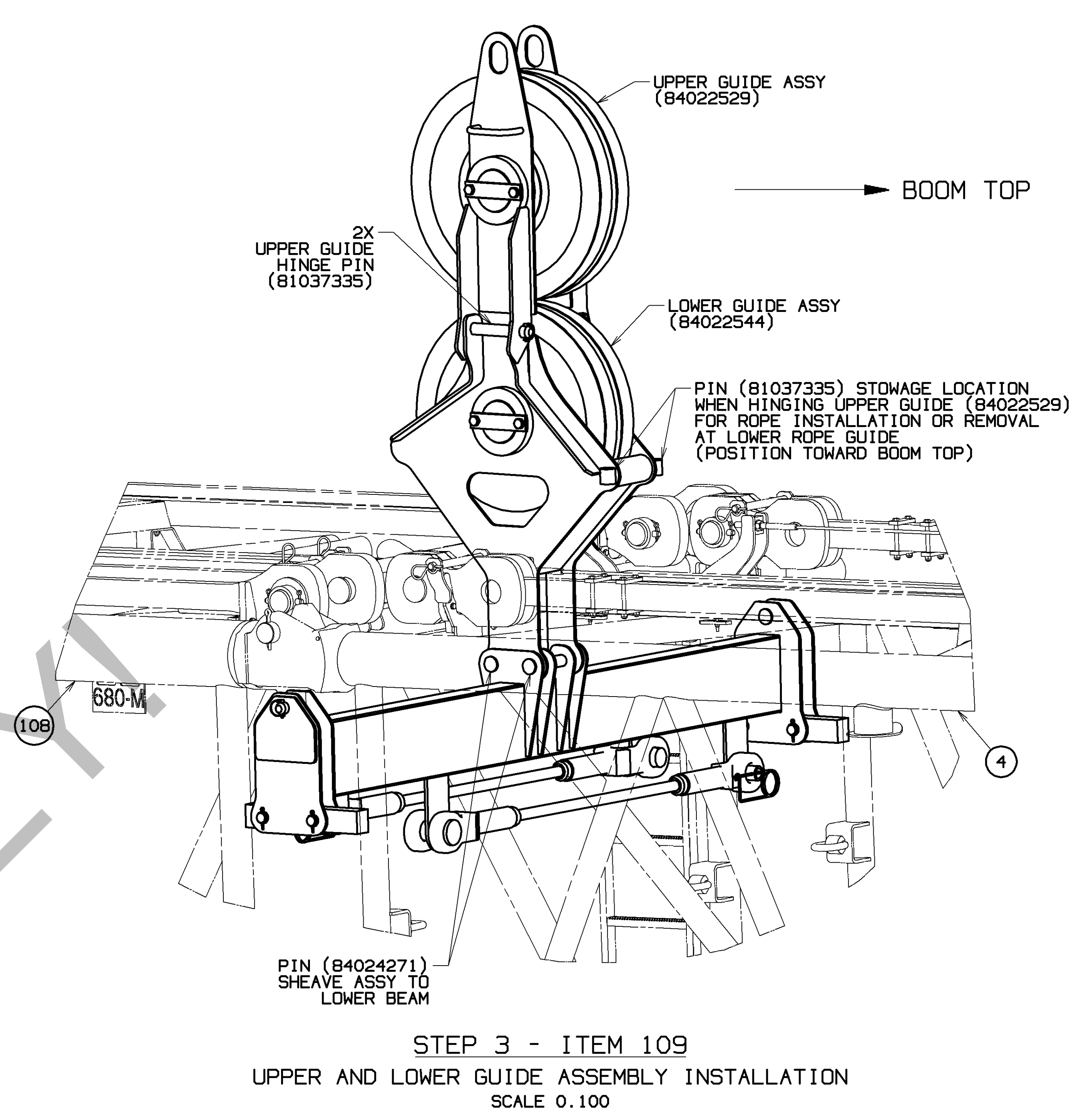
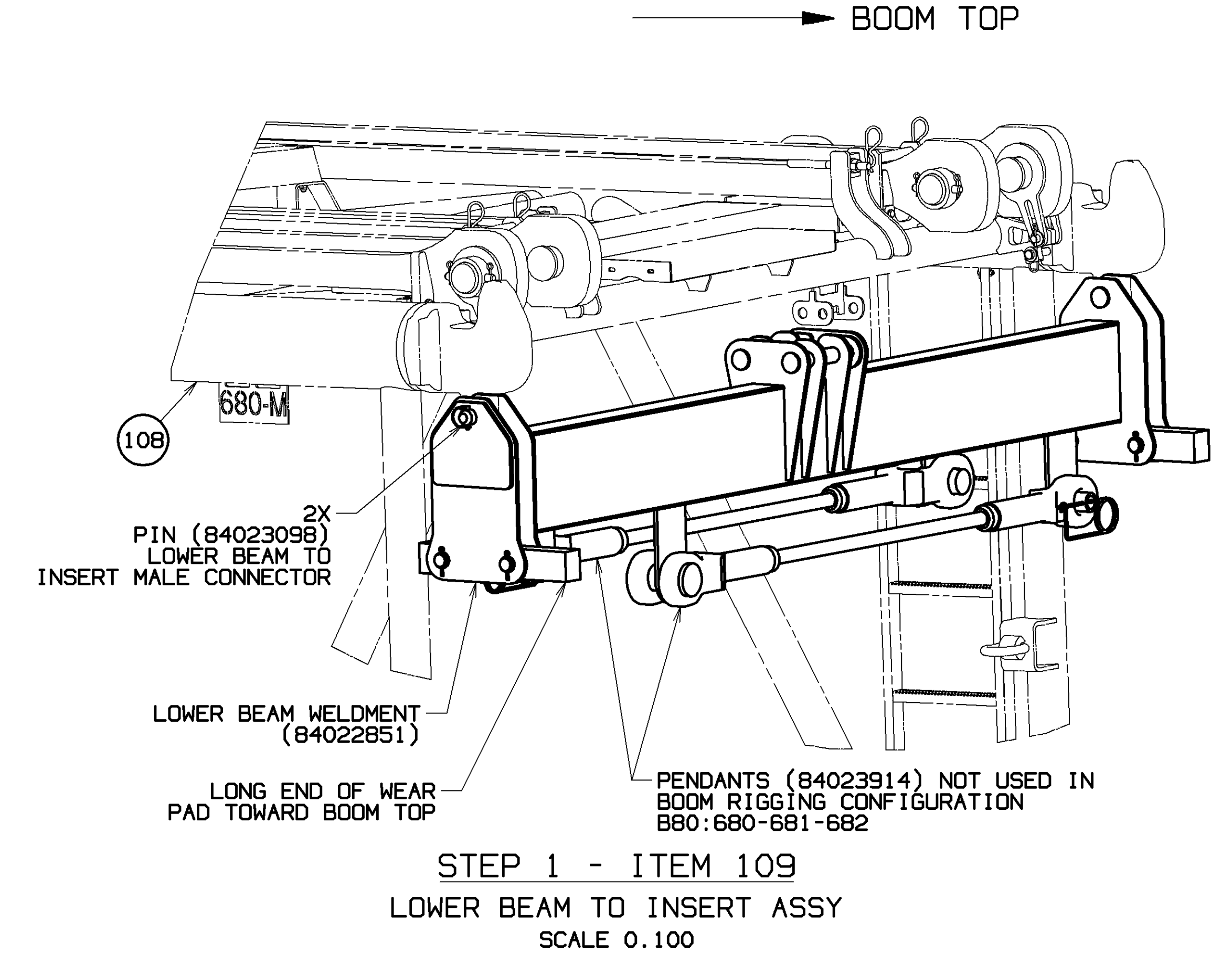
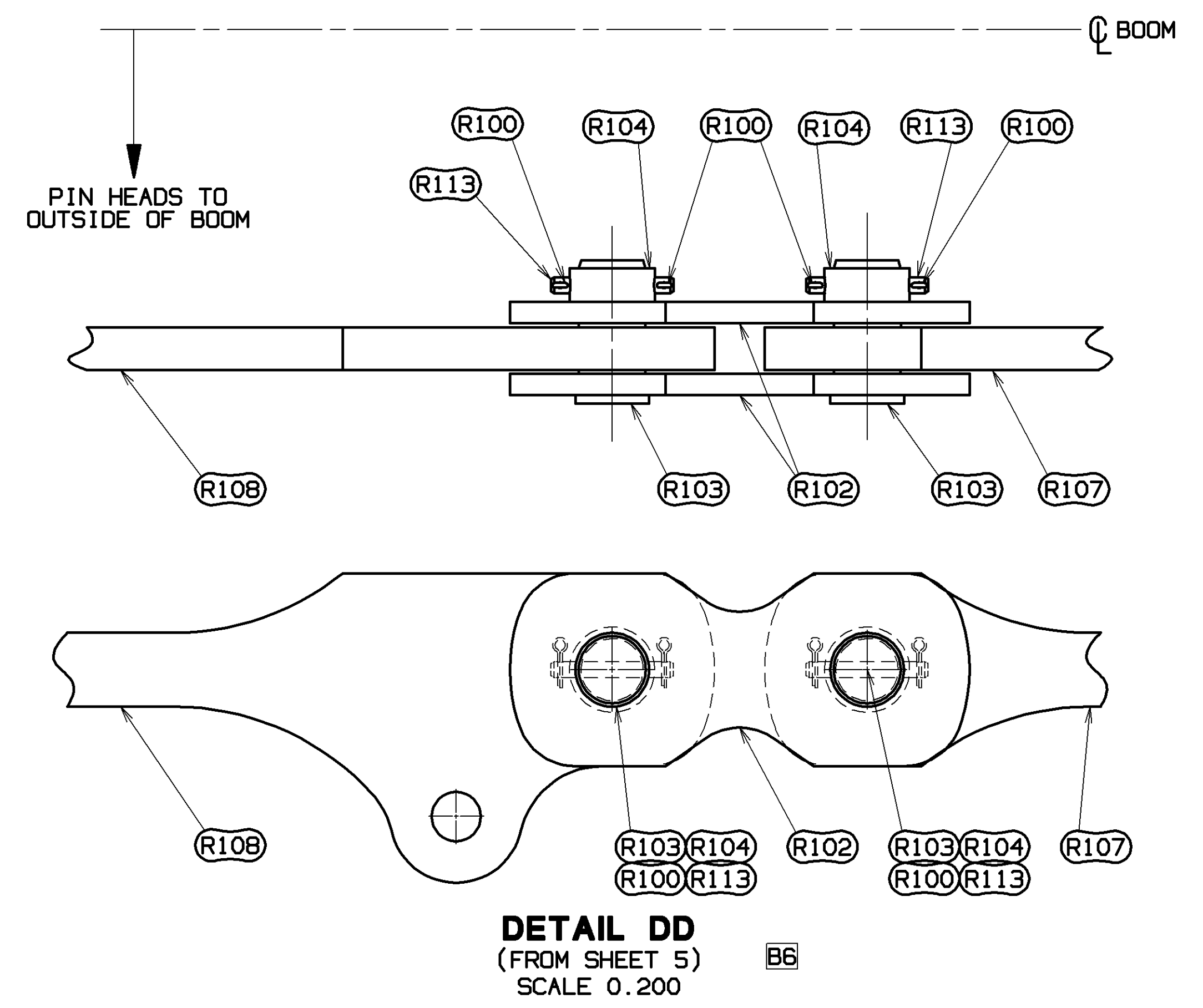
RECOMMENDED BOOM MAKEUP  
FOR TYP PIN JOINT SEE SECTIONS B-B & D-D,  
AND DETAILS G,H,J,K & DD

SEE DETAIL DD  
(SEE SHEET 6)

TOLERANCE UNLESS OTHERWISE SPECIFIED		MATERIAL		MANUFACTURING	
DECIMAL PLACES	FRACTIONS	DECIMAL PLACES	FRACTIONS	DECIMAL PLACES	FRACTIONS
1) PLACE 0.5	1/2	1) PLACE 0.5	1/2	1) PLACE 0.5	1/2
2) PLACE 0.00	0/100	2) PLACE 0.00	0/100	2) PLACE 0.00	0/100
3) PLACE 0.000	0/1000	3) PLACE 0.000	0/1000	3) PLACE 0.000	0/1000

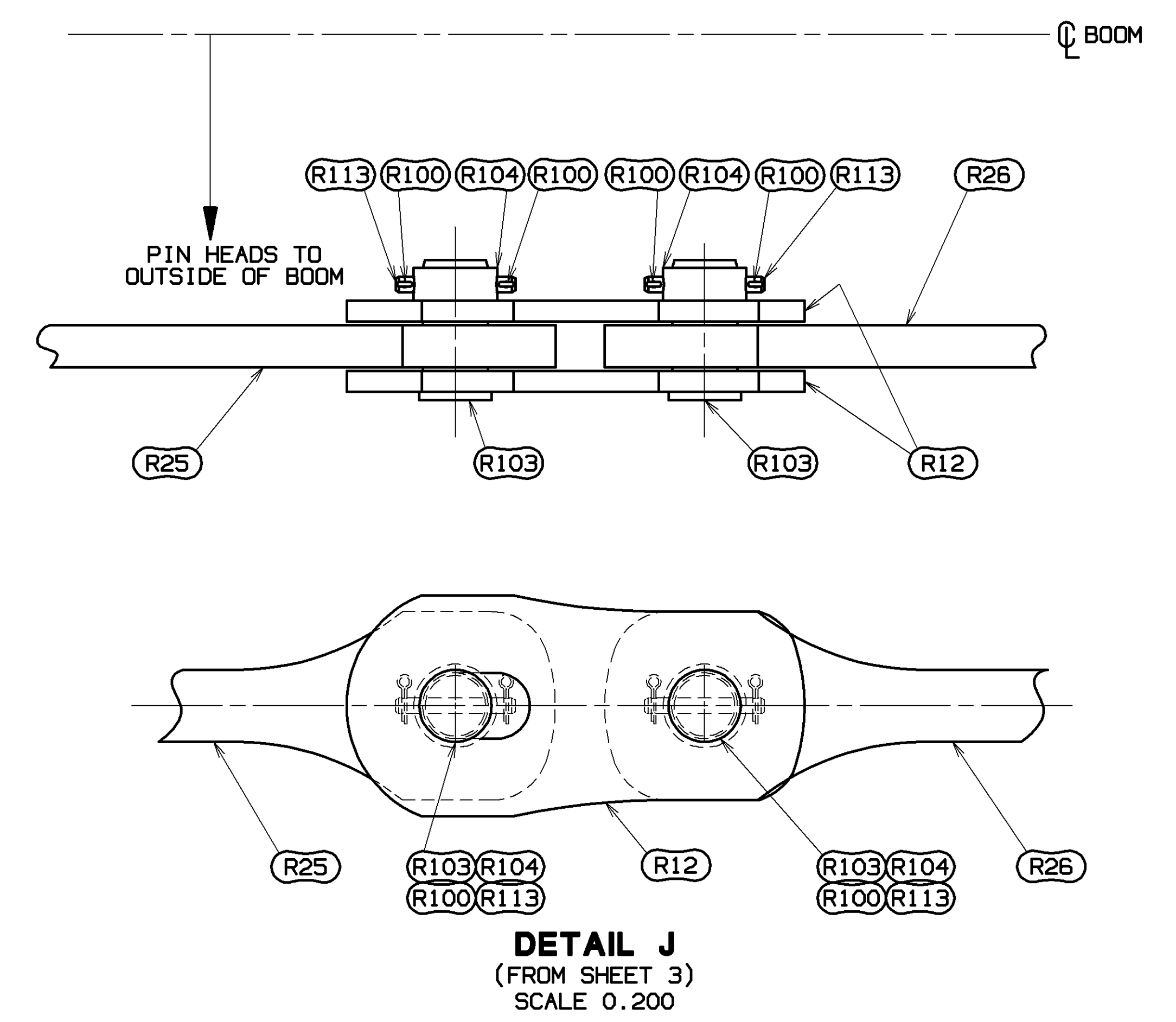
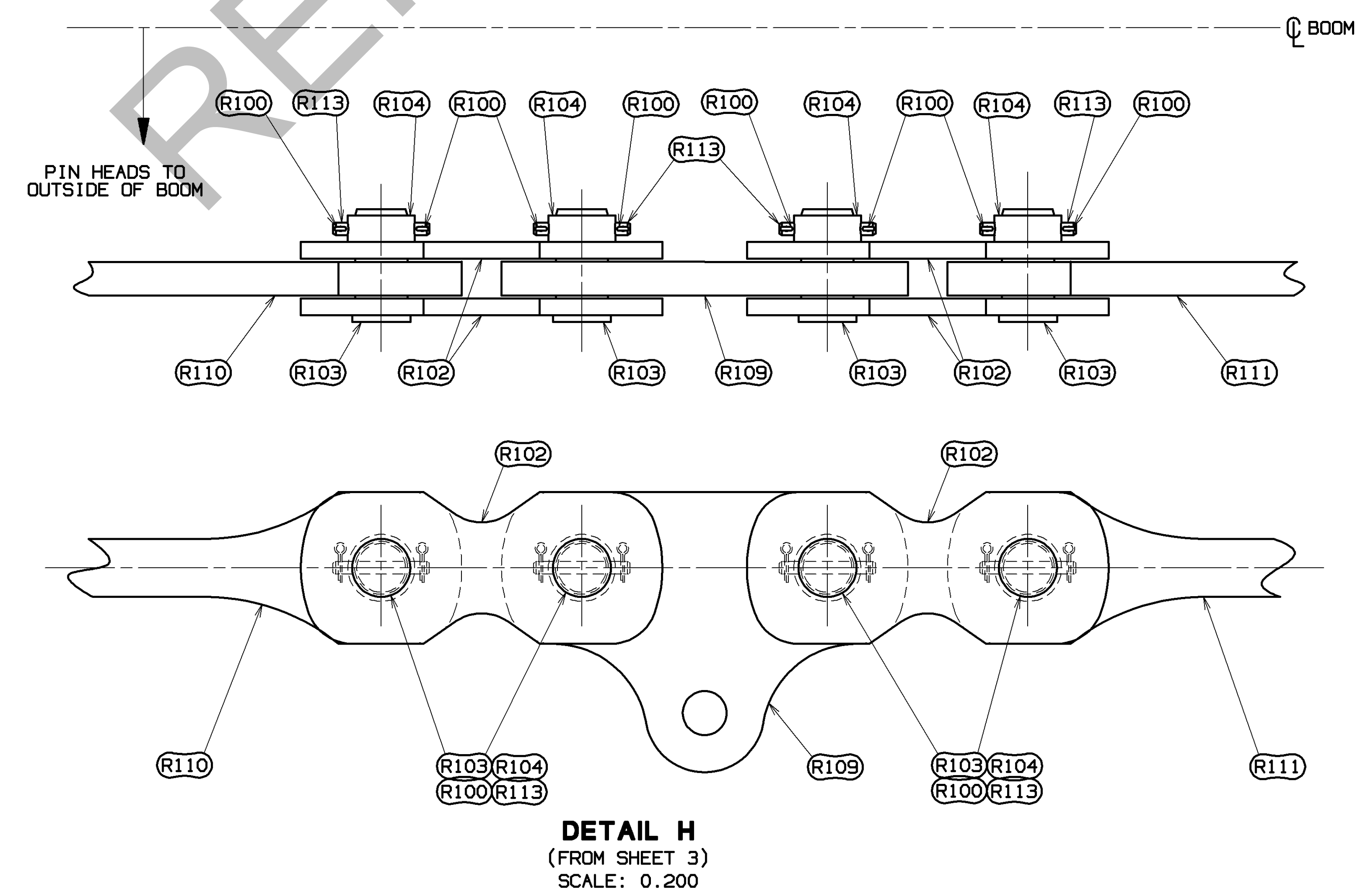
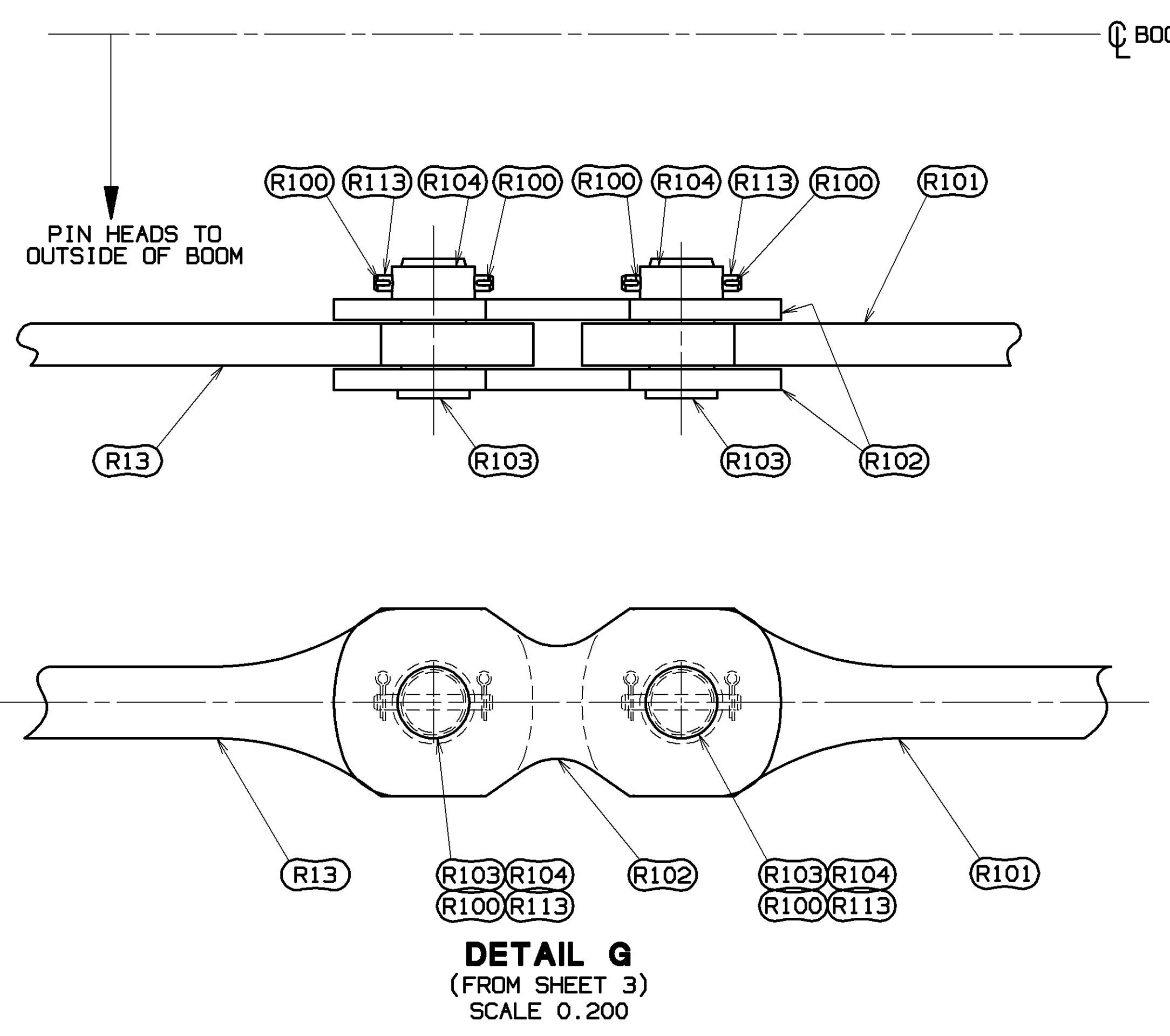
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REQUIREMENT TO  
CONFORM TO  
ENGINEERING  
SPECIFICATION  
8829103794 FOR  
COMPONENTS LISTED  
IN SECTION 05-05E  
DATE  
03-16-16  
REV. LTR.  
D





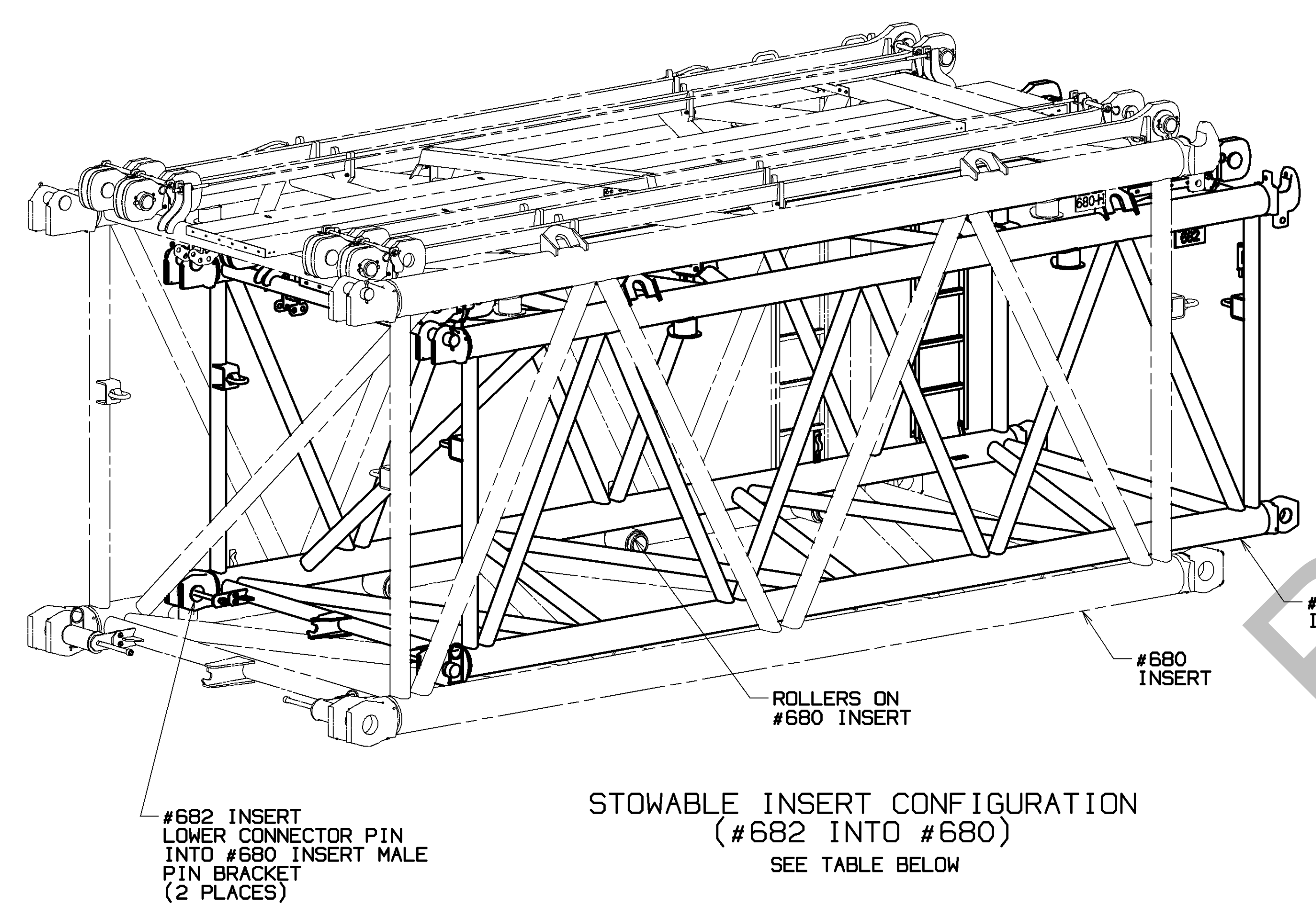
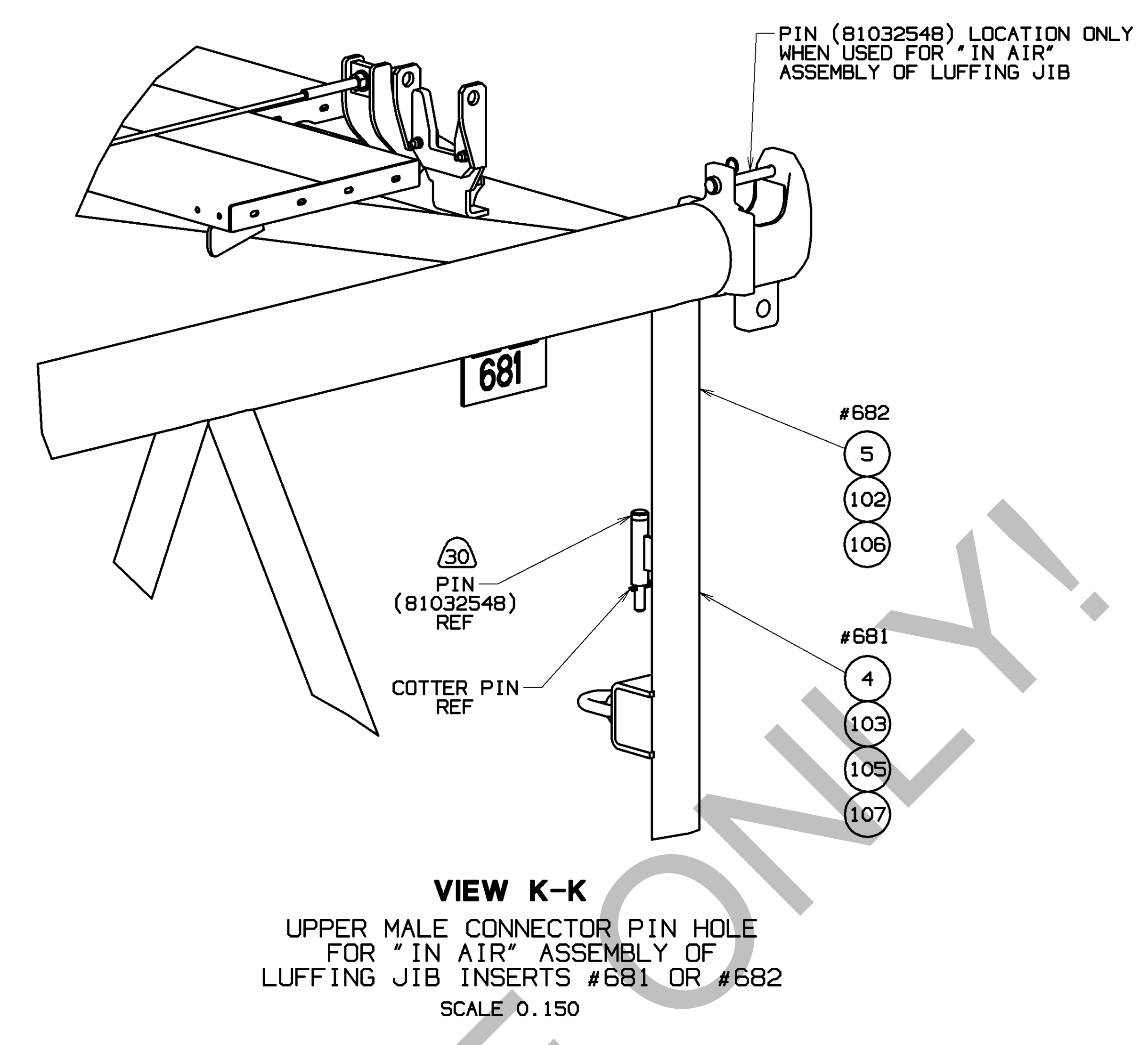
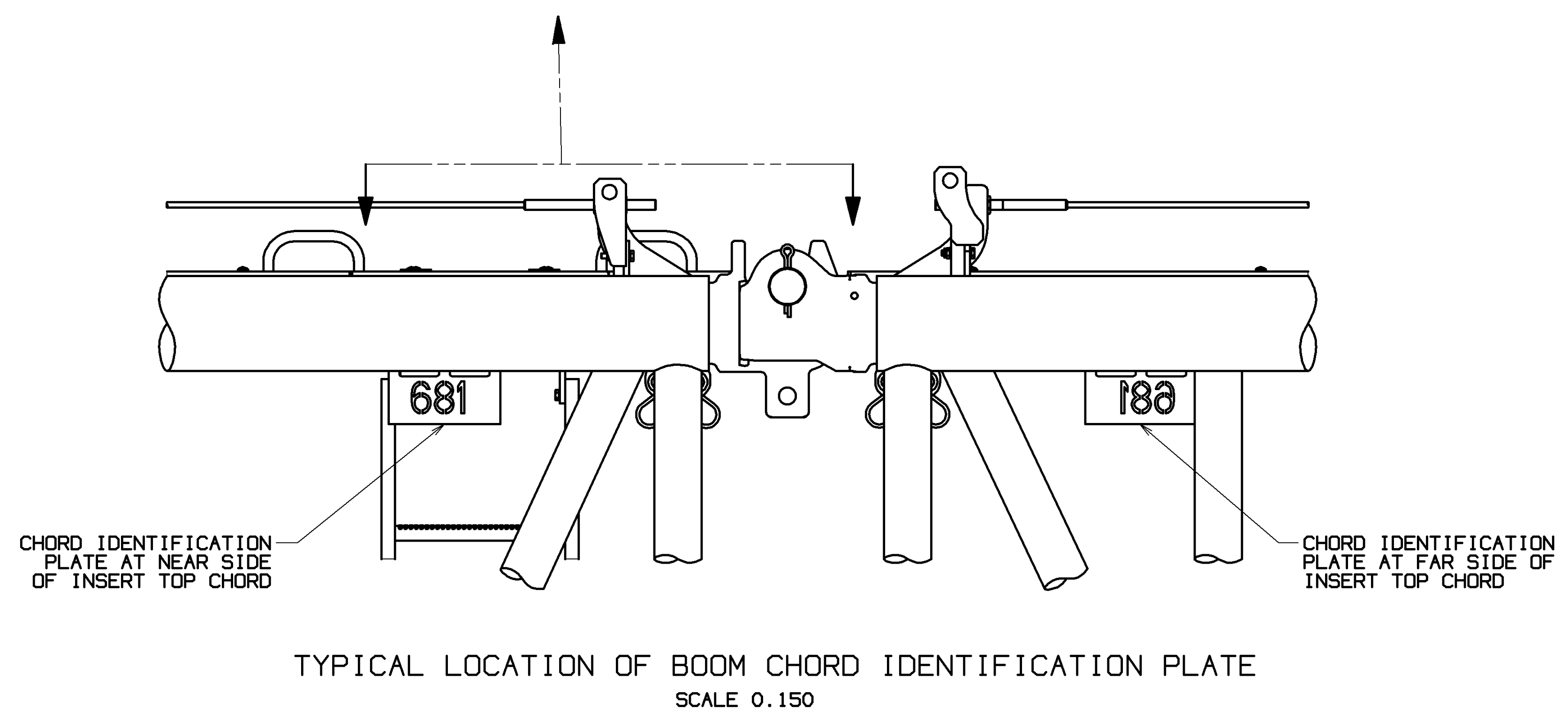
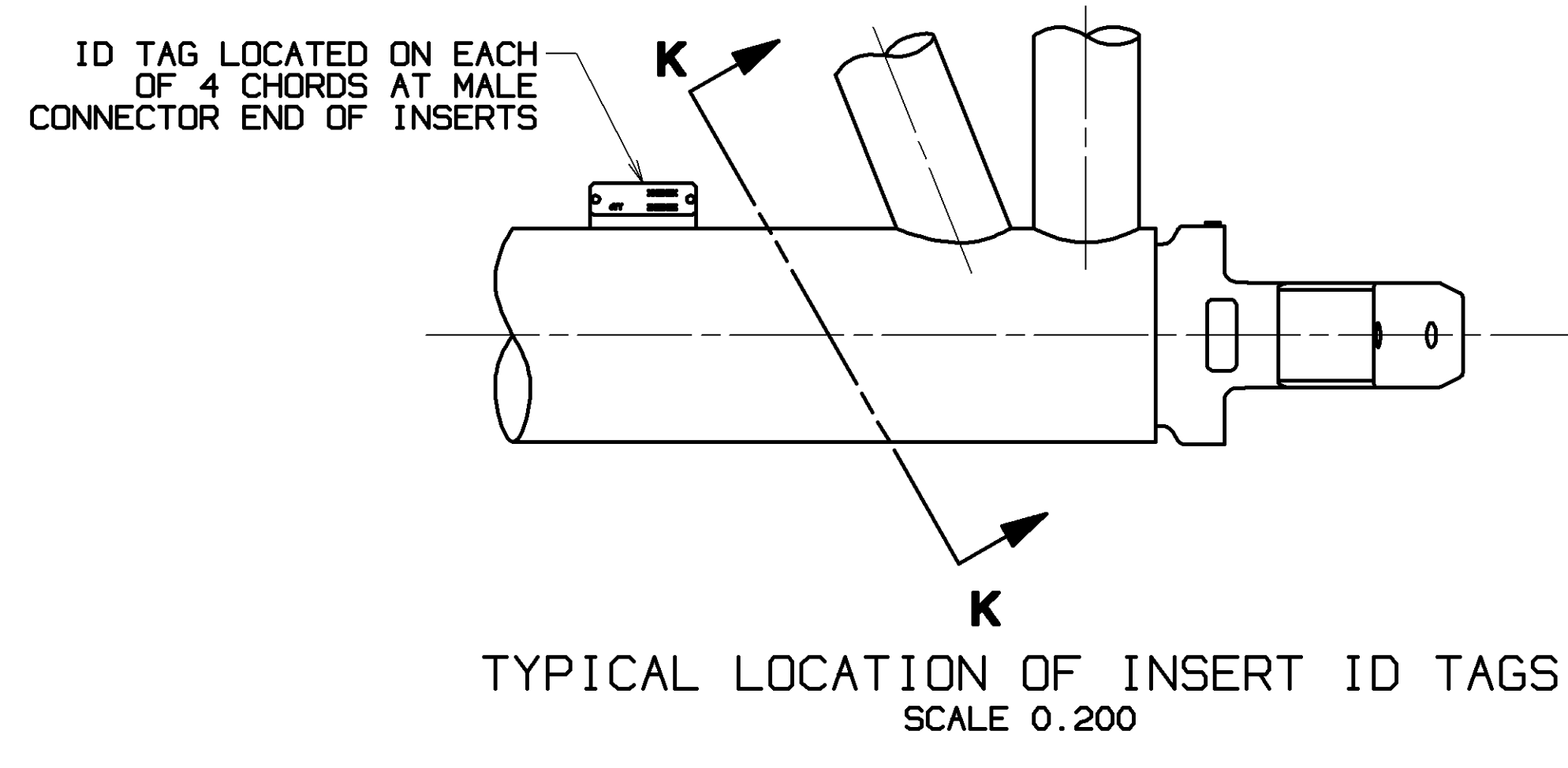
**DETAIL L**  
ENCAPSULATING SHEAVE (ITEM 109) INSTALLATION  
(FROM SHEET 3)

- STEP 1: INSTALL LOWER BEAM PORTION OF ITEM 109 TO MALE CONNECTOR FIXTURE HOLES ON 12M SUSPENSION INSERT (ITEM 108) WITH LOWER BEAM PINS (84023098). (POSITION LONG END OF WEAR PADS TOWARD BOOM TOP).
- STEP 2: ASSEMBLE #680/681 12M INSERT (ITEM 4) TO 12M SUSPENSION INSERT (ITEM 108) PER TYPICAL INSERT INSTALLATION. INSTALL LOWER BEAM CONNECTOR PINS. (SEE DETAIL N ON SHEET 8).
- STEP 3: INSTALL UPPER (84022529) AND LOWER (84022544) SHEAVE ASSEMBLY TO LOWER BEAM (84022851) AND ATTACH WITH PINS (84024271). (POSITION LOWER GUIDE ASSY WITH PIN STORAGE HOLDERS TOWARD BOOM TOP).

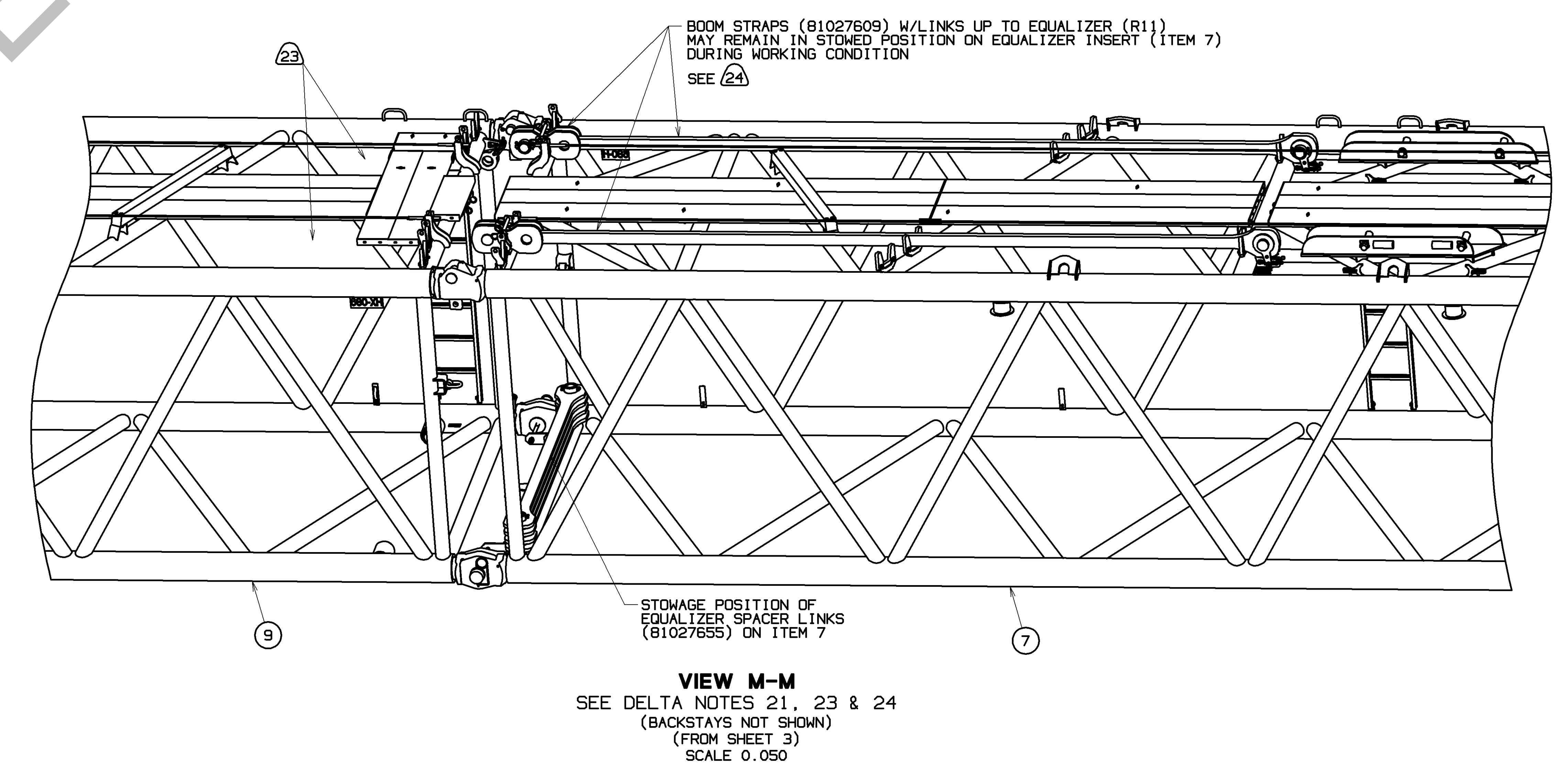


DECIMAL PLACES	FRACTION	MILS	ANGLES	FINISHING	DATE	BY
(1) PLACE 0.5	1/2	±.12	±.18	±.03		
(2) PLACE 0.00	1/16	±.08	±.12	±.015		
(3) PLACE 0.000	1/64	±.008	±.012	±.006		

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		DR. AJB	Maritowoc, Wisconsin	B80:680-681-682
		CK. RHV	MODEL: MLC650	
		APP. TJA		



STOWABLE INSERT CONFIGURATION (#682 INTO #680)	
#680 INSERT W/STOWABLE #682 INSERT FEATURE	#682 (12M) STOWABLE INSERT
81020424 (12M) (ITEM 100)	81021198 (ITEM 102) 81032715 (ITEM 106)
81021299 (12M) (ITEM 104)	81021198 (ITEM 102) 81032715 (ITEM 106)
81034977 (12M) (ITEM 9)	81021198 (ITEM 102) 81032715 (ITEM 106)



TOLERANCE UNLESS OTHERWISE SPECIFIED		MATERIAL	FINISH	MATERIAL	QTY	DESCRIPTION	DATE	REV. LTR.
DECIMAL PLACES	FRACTIONS							
(1) PLACE 0.5	±.12 ±.18 ±.05							
(2) PLACE 0.00	±.08 ±.12 ±.015							
(3) PLACE 0.000	±.008 ±.008 ±.008							
ANGLES	±1.30							

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DATE NOTED: 03-16-16  
 DR. AJB  
 CK. RHV  
 APP. TJA

Manitowoc Cranes, Inc.  
 Manitowoc, Wisconsin  
 MODEL MLC650

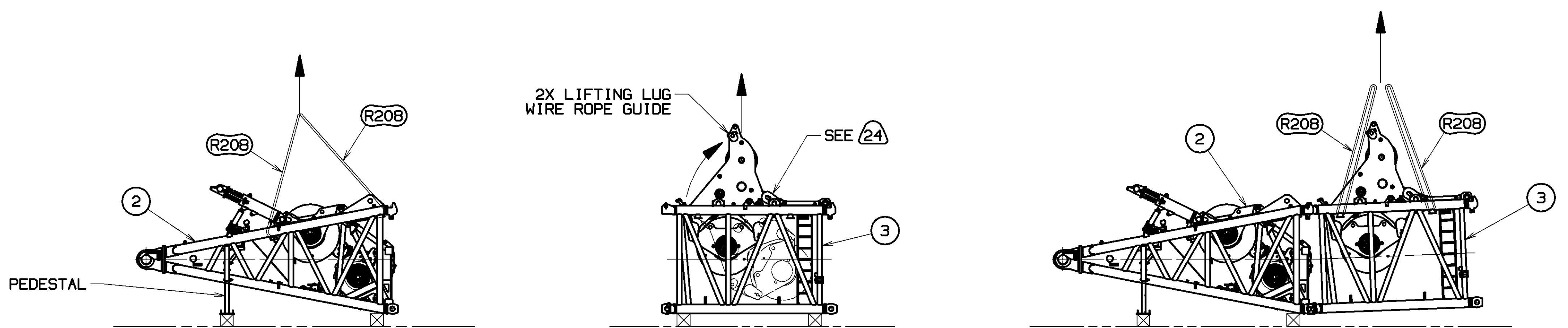
BOOM RIGGING  
 880-680-681-682

DATE: 03-16-16  
 REV. LTR.: D

81022864  
 SHT 7 OF 11



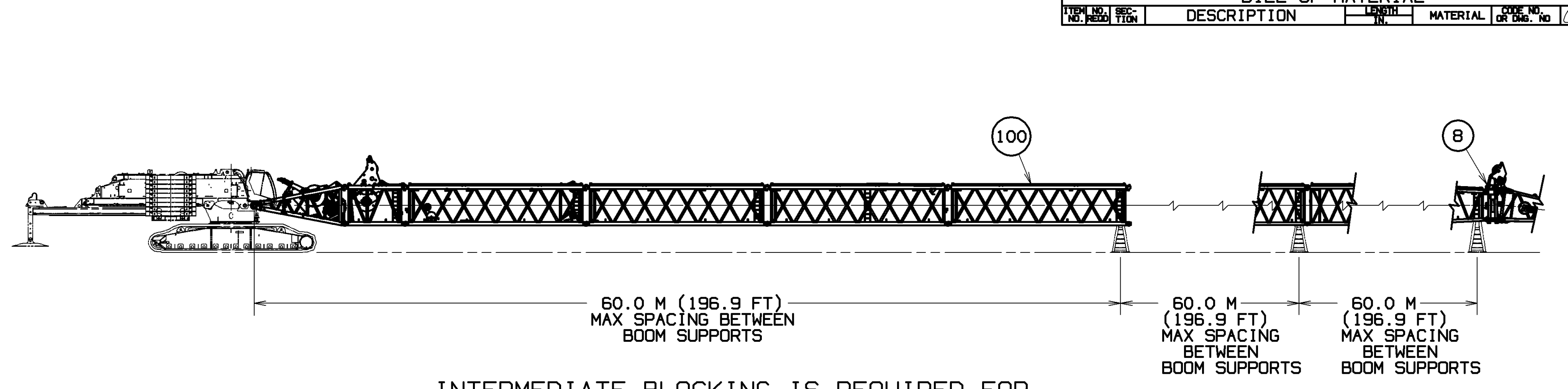
BILL OF MATERIAL		ASSEMBLIES USED ON
QTY	DESCRIPTION	MATERIAL



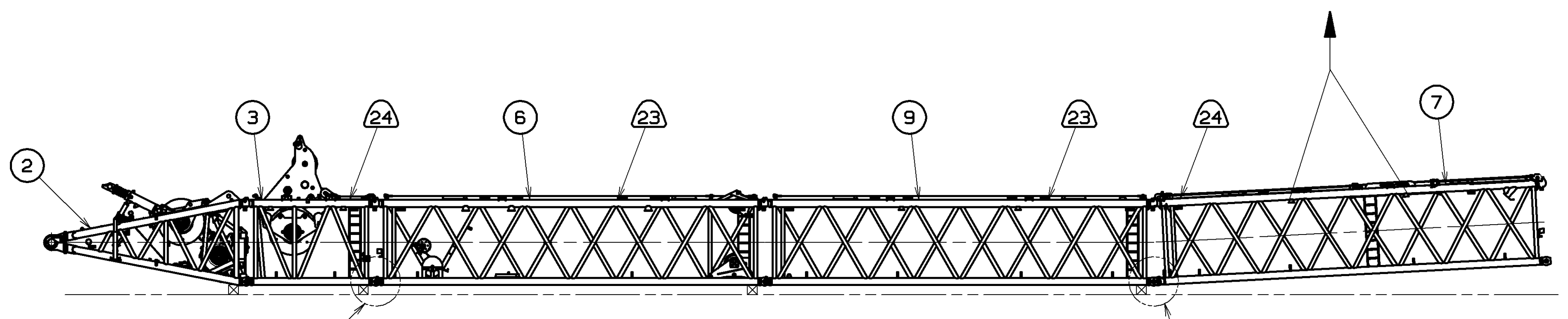
**STEP 1**  
**BOOM BUTT**  
 BLOCK AND POSITION BOOM BUTT (ITEM 2) WITH SUPPORT PEDESTAL DEPLOYED.  
 SCALE: 0.015

**STEP 2**  
**4M INSERT WIRE ROPE GUIDE**  
 POSITION 4M WIRE ROPE GUIDE INTO WORKING POSITION  
 SCALE: 0.015

**STEP 3**  
**4M INSERT TO BOOM BUTT**  
 ASSEMBLE 4M INSERT (ITEM 3) TO BOOM BUTT (ITEM 2) USING SLINGS (R208) ON 4M INSERT SLING POSTS.  
 SCALE: 0.015



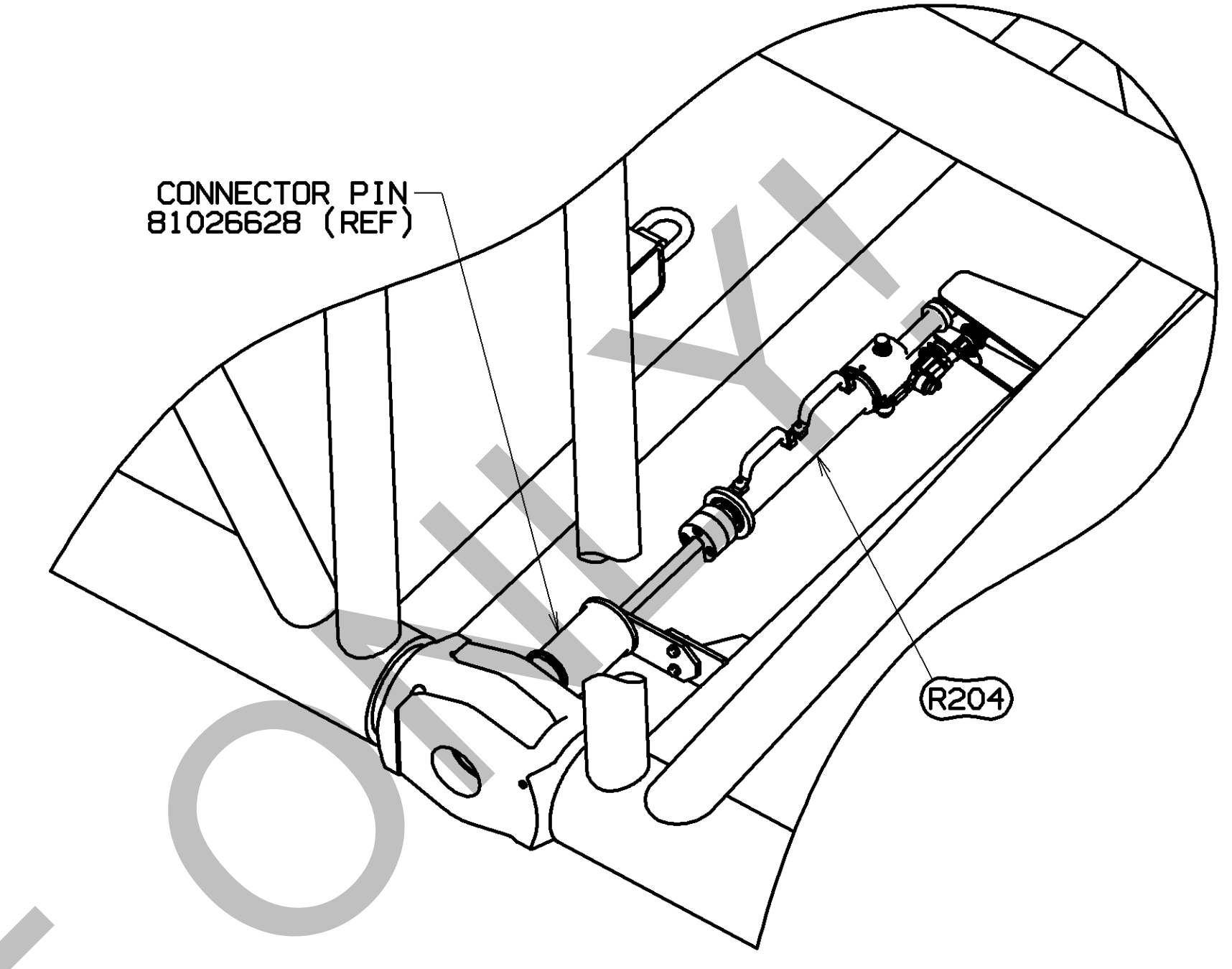
INTERMEDIATE BLOCKING IS REQUIRED FOR BOOM LENGTHS 131.0 M (429.8 FT) AND GREATER  
 SEE STEP 6 ON SHEET 9 FOR BOOM CLOSING INSTRUCTIONS  
 SCALE 0.005  
 C10



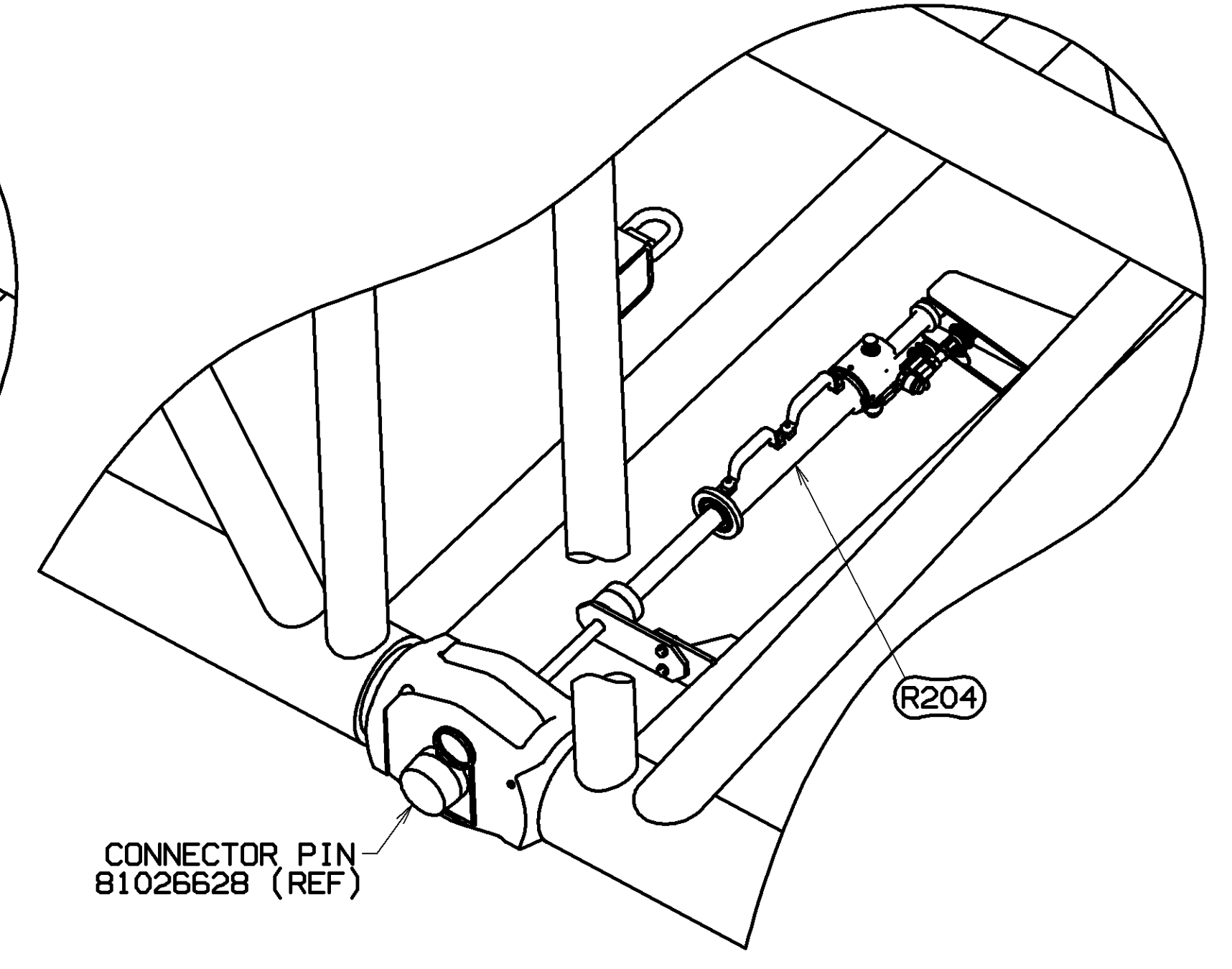
SEE DETAIL DD

**STEP 4**  
**BOOM BUTT TO EQUALIZER INSERT ASSEMBLY**

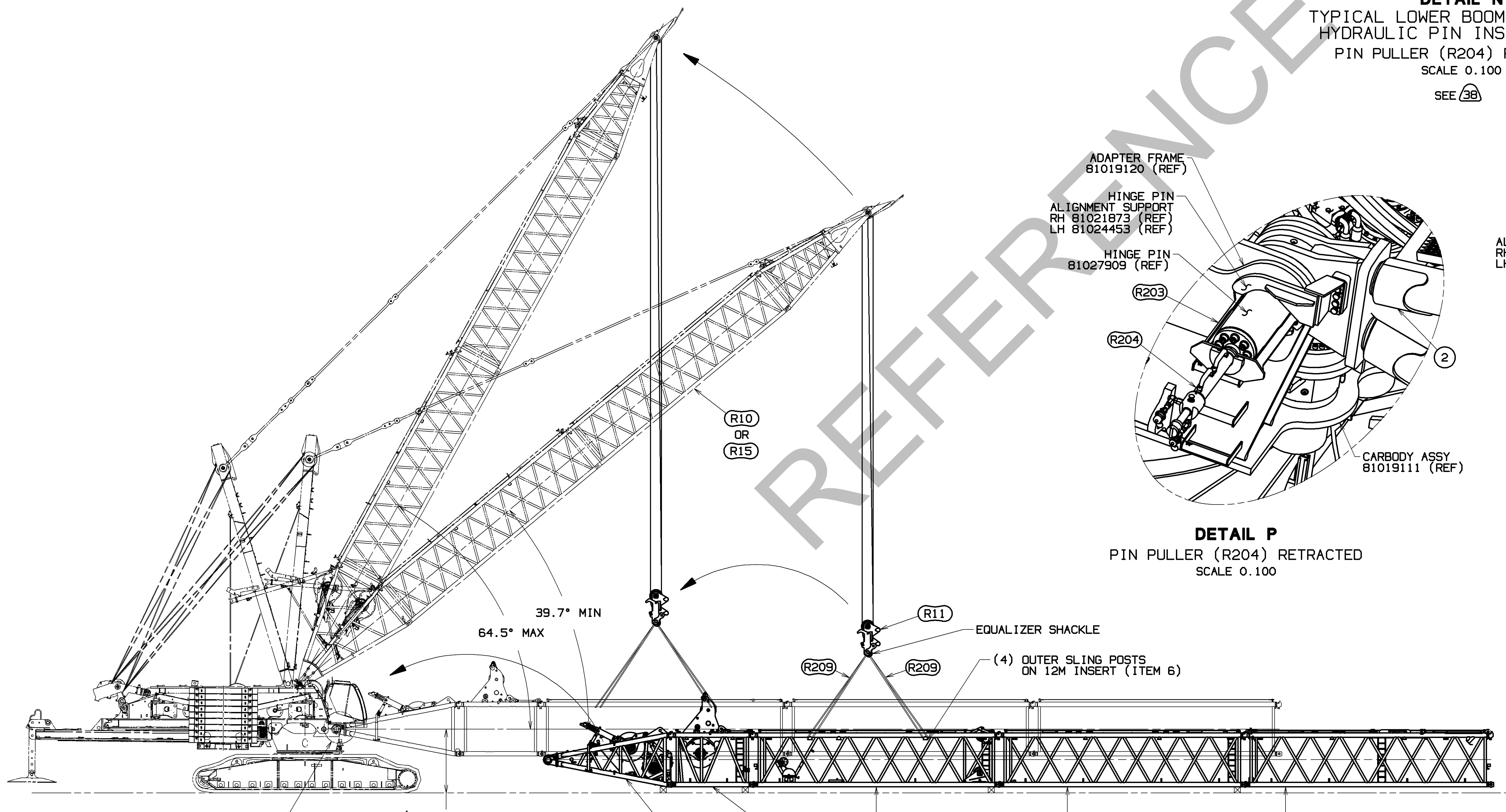
ASSEMBLE 12M BOOM INSERT W/SHEAVES (ITEM 6) TO BUTT/4M ASSEMBLY. INSTALL LOWER BOOM CONNECTOR PINS (R8). (SEE DETAIL DD). CONTINUE TO ASSEMBLE 12M BOOM INSERT (ITEM 9) AND EQUALIZER INSERT (ITEM 7). (REFER TO SHEETS 3, 4 & 5 FOR REQUIRED BOOM CONFIGURATIONS). INSTALL LOWER BOOM CONNECTOR PINS PER DETAIL "N". REMOVE UNUSED BOOM STRAPS/LINKS AS INDICATED PER DELTA NOTES 21, 23 & 24 AND VIEW M-M ON SHEET 7. FOR STATUS OF BACKSTAY STRAPS REFER TO DELTA NOTE 25. RETRACT BOOM BUTT SUPPORT PEDESTAL PRIOR TO ASSEMBLY OF BOOM TO ADAPTER FRAME HINGE.



**DETAIL N**  
 TYPICAL LOWER BOOM CONNECTOR HYDRAULIC PIN INSTALLATION  
 PIN PULLER (R204) RETRACTED  
 SCALE 0.100  
 SEE 38



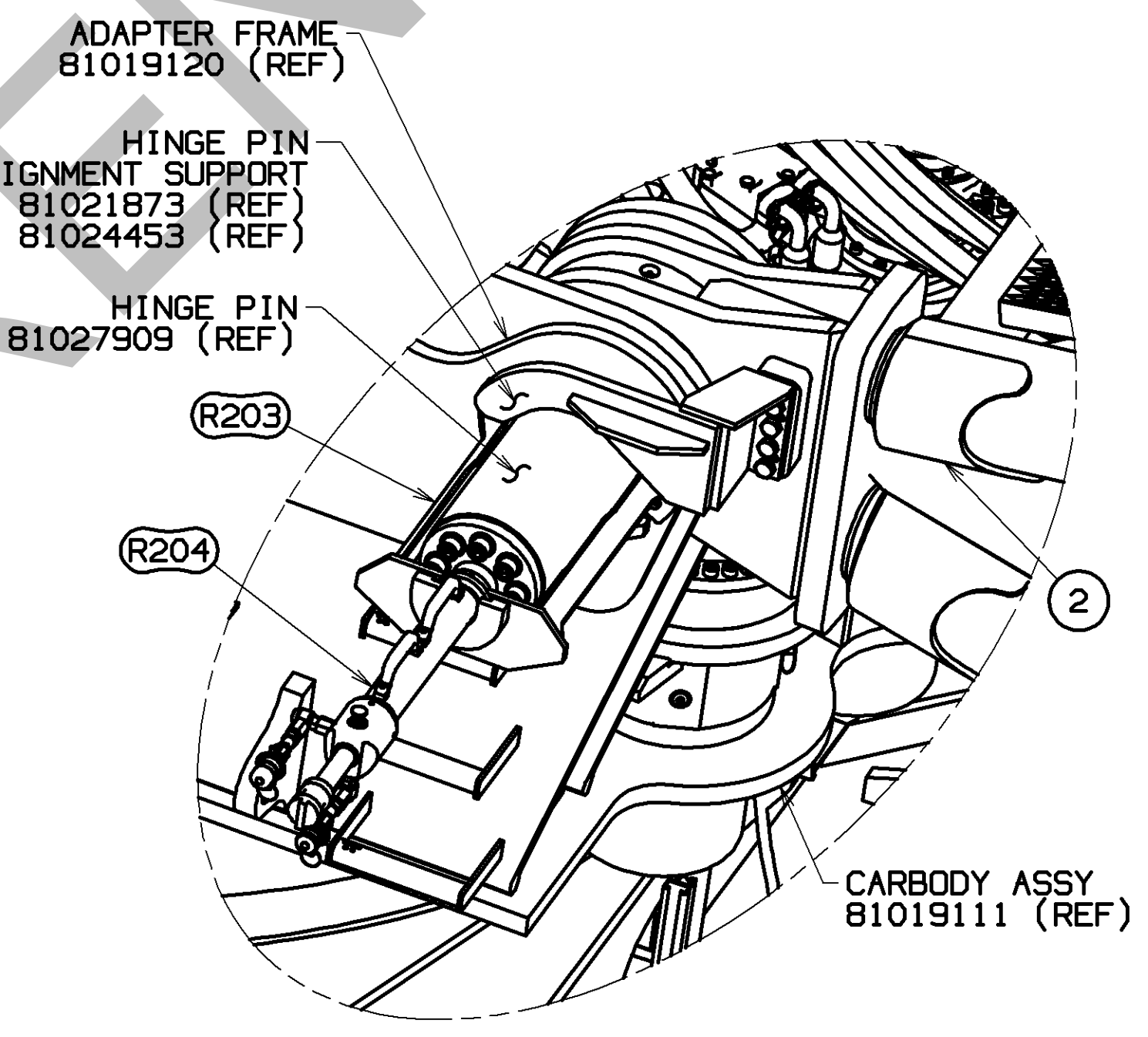
**DETAIL N**  
 TYPICAL LOWER BOOM CONNECTOR HYDRAULIC PIN INSTALLATION  
 PIN PULLER (R204) EXTENDED  
 SCALE 0.100  
 SEE 38



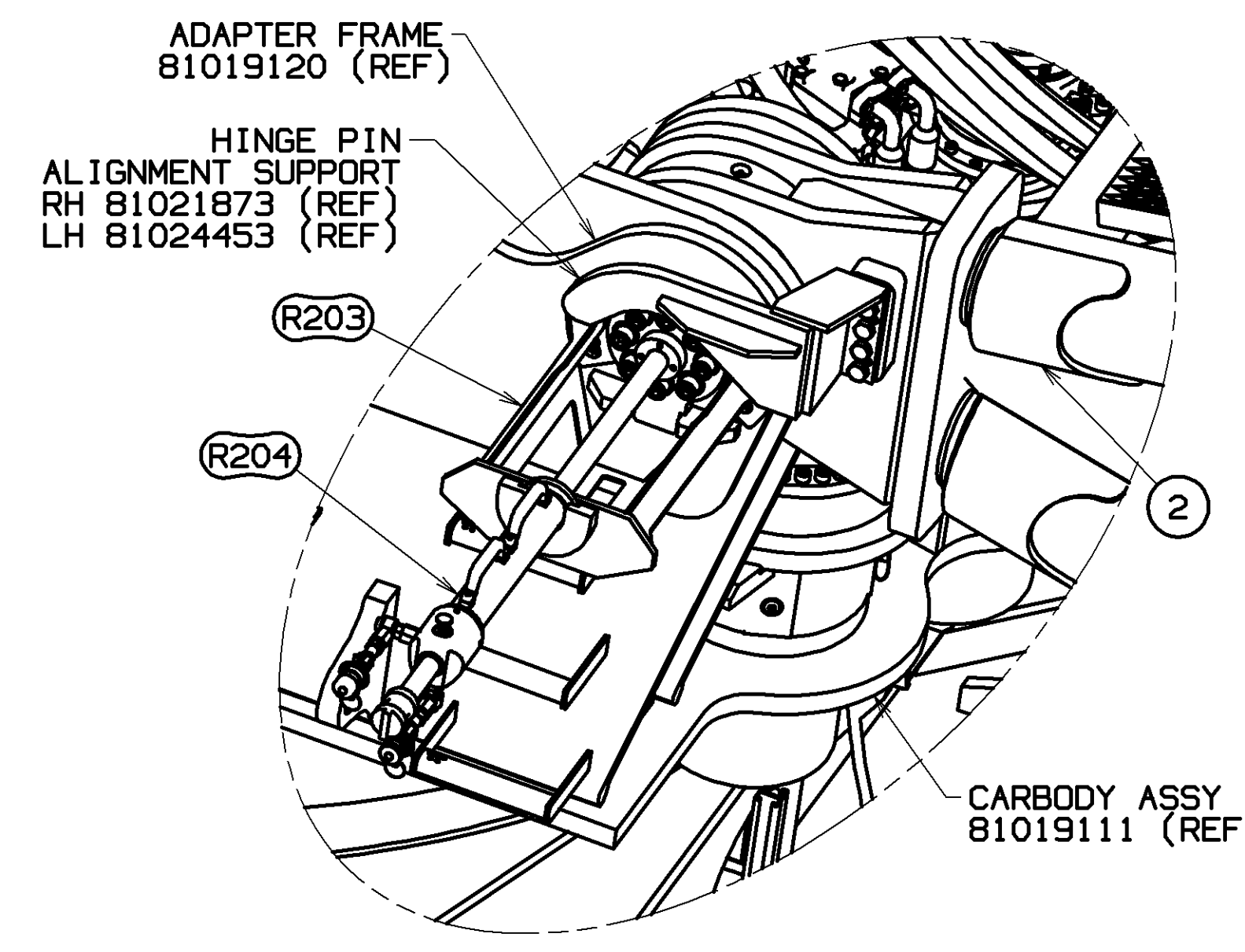
SEE DETAIL P

(3114.6 mm / 122.62 in)  
 C11

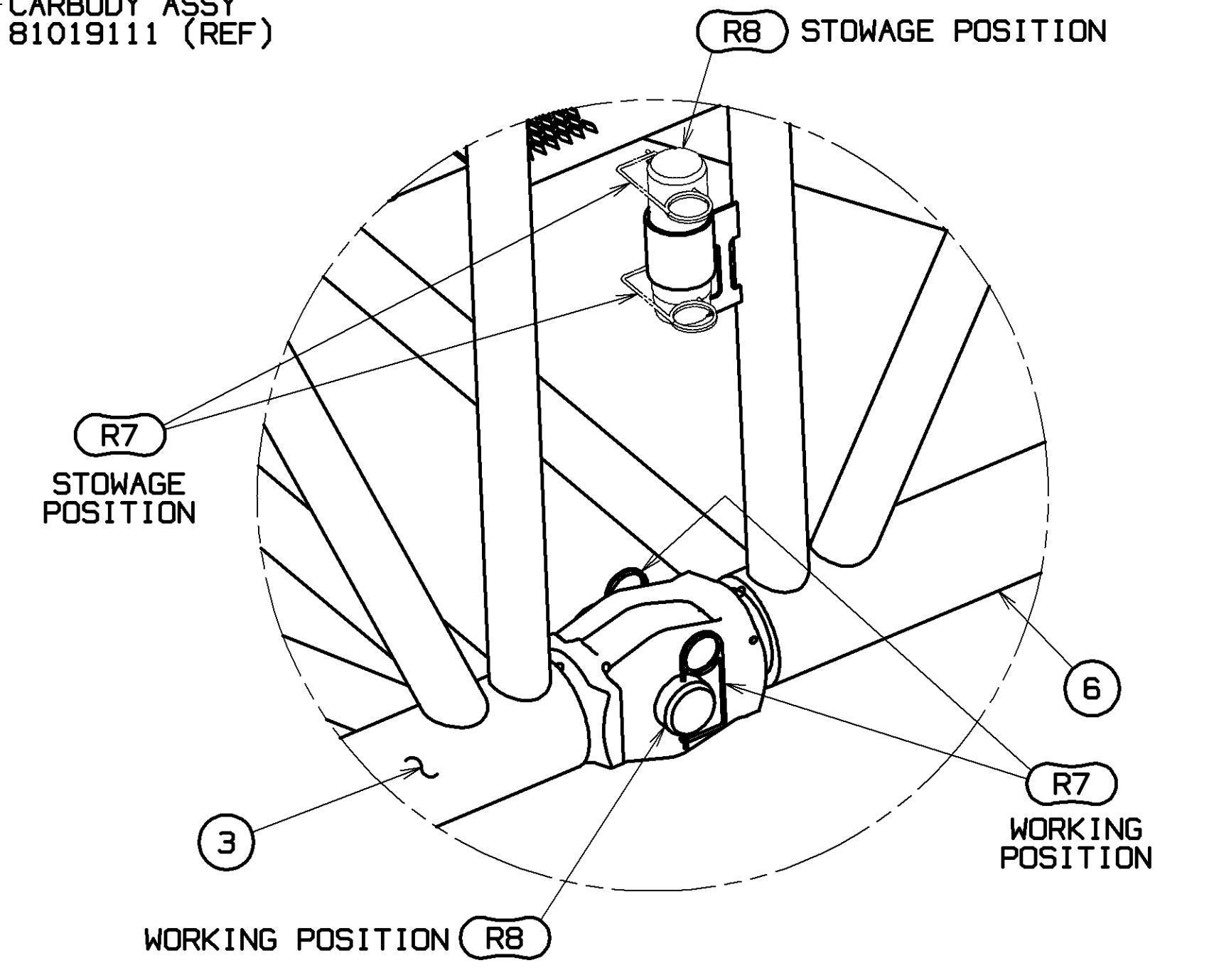
**STEP 5**  
**BUTT/EQUALIZER ASSY TO ADAPTER FRAME HINGE USING FIXED MAST**  
 ATTACH (4) SLINGS (R209) FROM EQUALIZER (R11) SHACKLES TO OUTER SLING POSTS ON 12M INSERT (ITEM 6). USING PREVIOUSLY ASSEMBLED FIXED MAST (R10 OR R15) PER ASSEMBLY INSTRUCTIONS 81025005 OR 84050187, ASSEMBLE THE BUTT/EQUALIZER ASSEMBLY (STEP 4) TO ADAPTER FRAME HINGE. POSITION HINGE PIN ALIGNMENT SUPPORT ON PIN. (SEE DETAIL P). POSITION PIN PULLER ASSY (R204) INTO PIN PULLER CAGE WELDMENT (R203) AND ACTIVATE CYLINDER TO INSTALL HINGE PIN INTO BUTT. (SEE DETAIL P). FIXED MAST OPERATING RANGE WHEN ASSEMBLING BOOM IS 39.7° TO 64.5°. LOWER BOOM ONTO BLOCKING AND DISCONNECT SLINGS (R209) FROM 12M INSERT (ITEM 6).



**DETAIL P**  
 PIN PULLER (R204) RETRACTED  
 SCALE 0.100



**DETAIL P**  
 PIN PULLER (R204) EXTENDED  
 SCALE 0.100

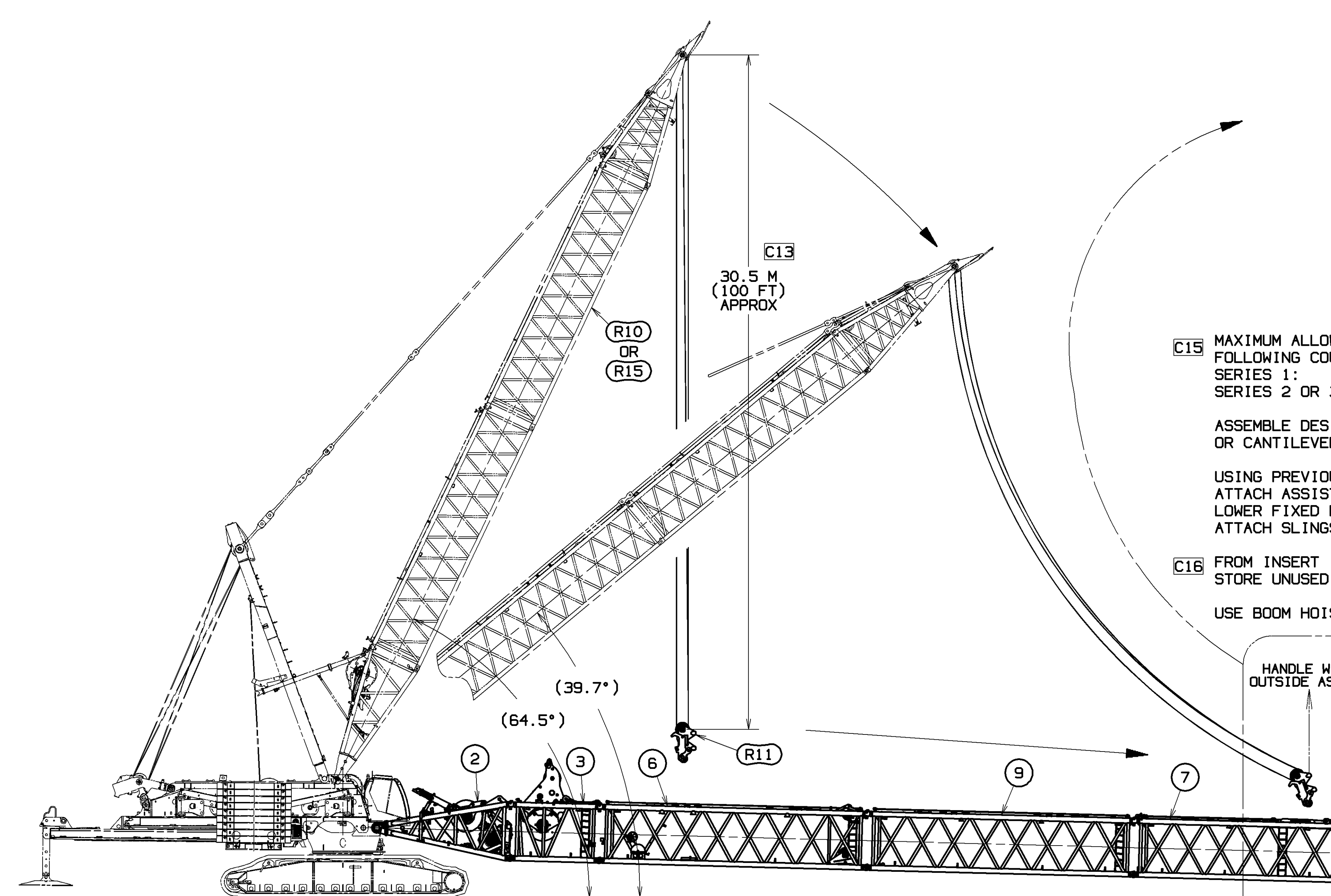


**DETAIL DD**  
 4M TO 12M INSERT LOWER BOOM CONNECTOR MANUAL PIN INSTALLATION  
 SCALE 0.100  
 SEE 38 C12

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	C12	81022864 SHT 8 OF 11	81022864 SHT 8 OF 11	81022864 SHT 8 OF 11



BILL OF MATERIAL		ASSEMBLIES USED IN
QTY	DESCRIPTION	MATERIAL



**STEP 6  
ALTERNATE BOOM CLOSING  
WITH FIXED MAST**

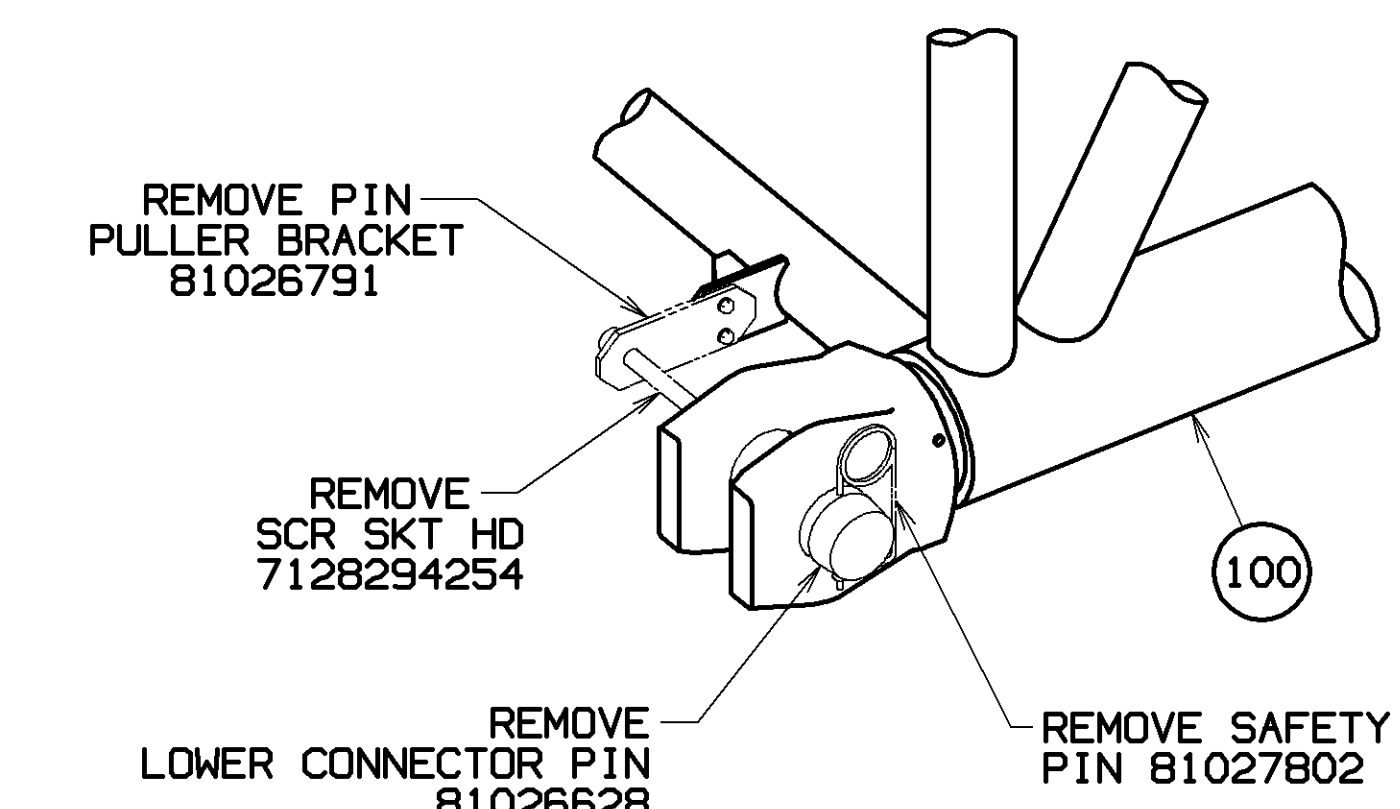
**C15** MAXIMUM ALLOWABLE BOOM LENGTH TO BE CLOSED WHILE EQUIPPED WITH THE FOLLOWING COUNTERWEIGHT CONFIGURATIONS:  
 SERIES 1: 125.0 M (410.1 FT)  
 SERIES 2 OR 3: 152.0 M (498.7 FT)

ASSEMBLE DESIRED BOOM LENGTH CONFIGURATION PER SHEETS 3, 4 & 5 OR CANTILEVERED INSERTS PER TABLE SHEET 2 FOR BOOM HANDLING WITH EQUALIZER.

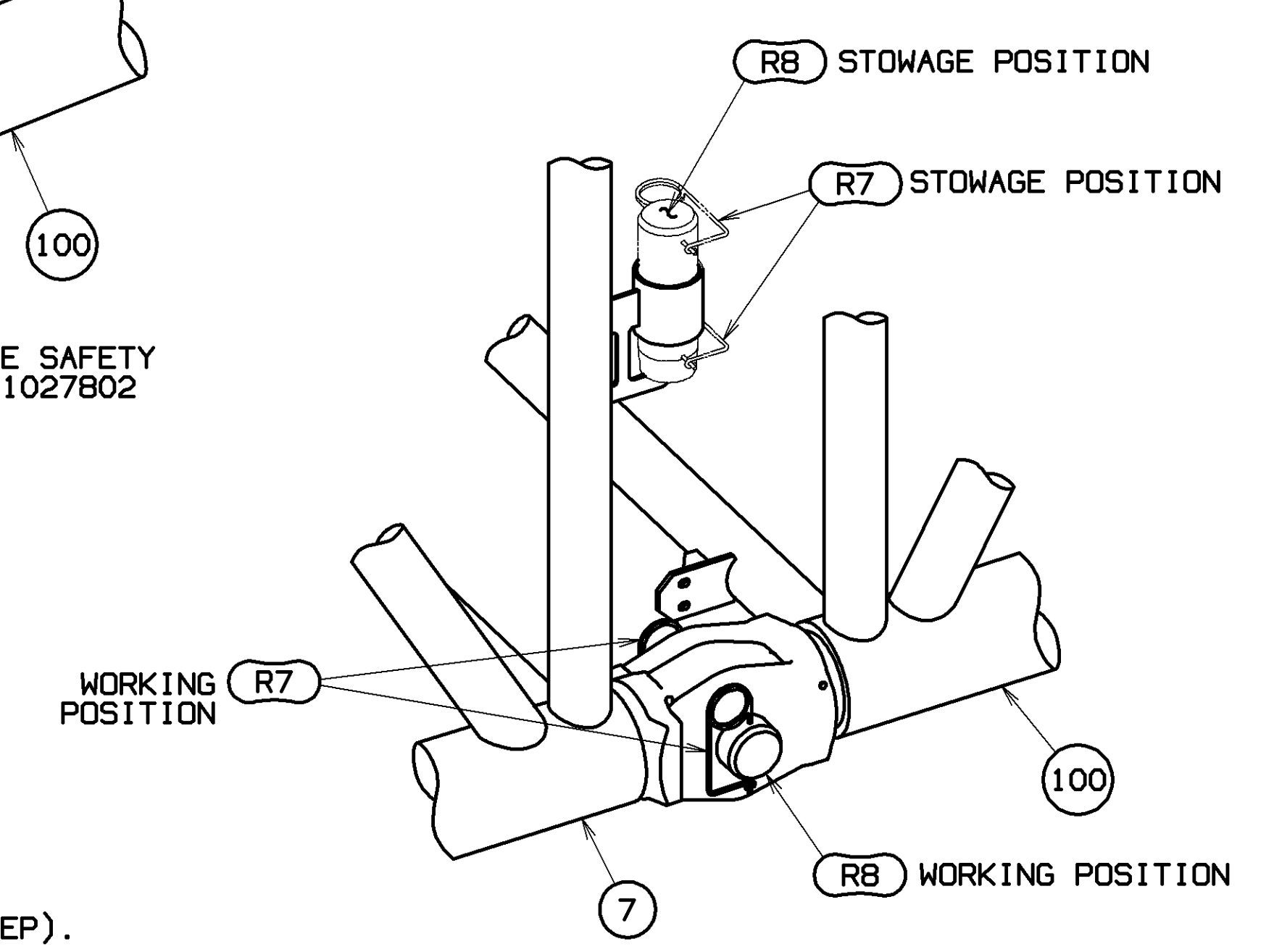
USING PREVIOUSLY ASSEMBLED FIXED MAST (R10 OR R15) PER ASSEMBLY INSTRUCTIONS 81025005 OR 84050187 ATTACH ASSIST CRANE TO EQUALIZER (R11) UPPER SLING POSTS. (SEE DETAIL R). LOWER FIXED MAST (R10 OR R15) WHILE PULLING EQUALIZER (R11) TOWARDS EQUALIZER INSERT (ITEM 7). ATTACH SLINGS (R205) TO EQUALIZER SHACKLES (SEE DETAIL R) AND SLING POSTS ON EQUALIZER INSERT (INSERT 7).

**C16** FROM INSERT (ITEM 100) REMOVE LOWER BOOM CONNECTOR PIN COMPONENTS USED WITH HAND HELD CYLINDER. (SEE DETAIL EE-PREP). STORE UNUSED COMPONENTS IN PARTS BOX 81028467.

USE BOOM HOIST TO CLOSE BOOM JOINT AT EQUALIZER INSERT (ITEM 7) AND INSTALL LOWER BOOM CONNECTOR PINS (R8). (SEE DETAIL EE-WORKING).  
 SCALE 0.015



**DETAIL EE - PREP**  
SCALE 0.100



**DETAIL EE - WORKING**  
SCALE 0.100

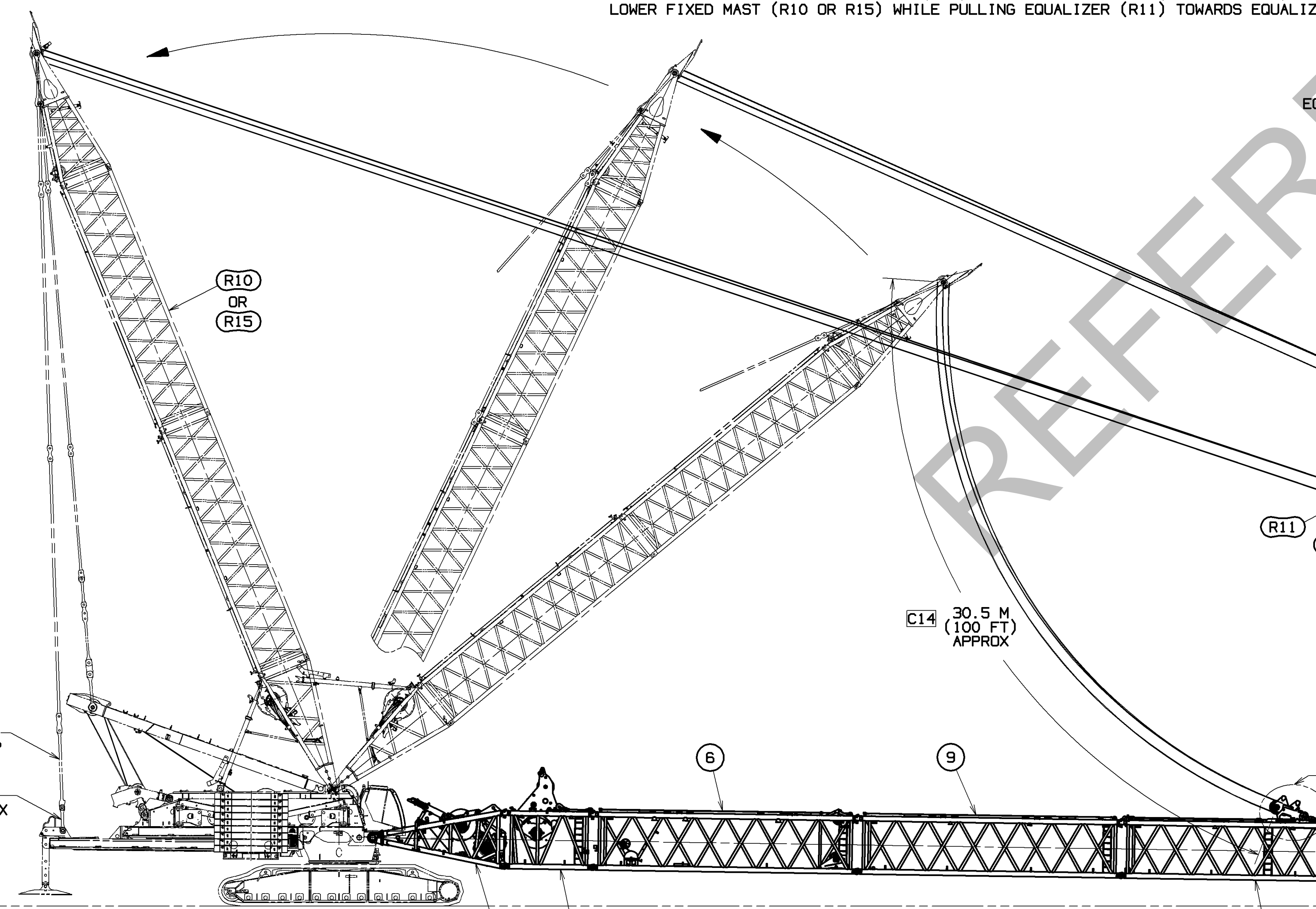
**STEP 6  
BOOM CLOSING WITH OUTSIDE ASSIST**

ASSEMBLE DESIRED BOOM LENGTH CONFIGURATION PER SHEETS 3, 4 & 5 OR CANTILEVERED INSERTS PER TABLE SHEET 2 FOR BOOM HANDLING WITH EQUALIZER.

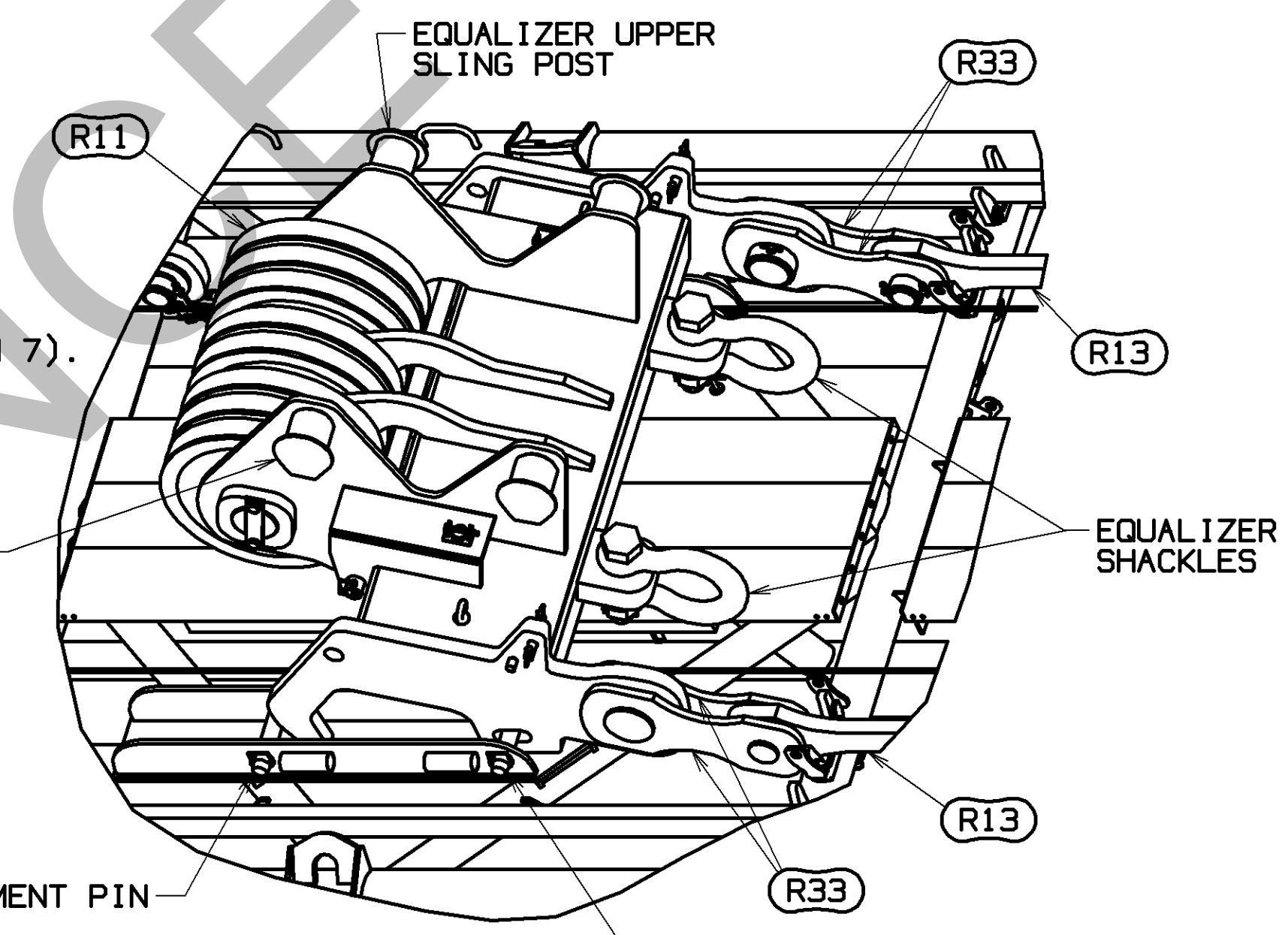
**C17** FROM INSERT (ITEM 100) REMOVE LOWER BOOM CONNECTOR PIN COMPONENTS USED WITH HAND HELD CYLINDER. (SEE DETAIL EE-PREP). STORE UNUSED COMPONENTS IN PARTS BOX 81028467.

USING OUTSIDE ASSIST TO CLOSE BOOM, LIFT UP ON EQUALIZER INSERT (ITEM 7) AT SLING POSTS. INSTALL EQUALIZER INSERT LOWER BOOM CONNECTOR PINS (R8). (SEE DETAIL EE-WORKING).

ATTACH ASSIST CRANE TO EQUALIZER (R11) UPPER SLING POSTS. (SEE DETAIL R). LOWER FIXED MAST (R10 OR R15) WHILE PULLING EQUALIZER (R11) TOWARDS EQUALIZER INSERT (ITEM 7).



**SEE DETAIL EE**



**DETAIL R**  
SCALE 0.060

**SEE DETAIL R**

**STEP 7  
EQUALIZER TO STRAPS ASSEMBLY**

LOWER EQUALIZER (R11) ONTO RAILS OF EQUALIZER INSERT (ITEM 7).

**C20** NOTE: IF USED ALTERNATE BOOM CLOSING W/FIXED MAST, DETACH SLINGS (R205) FROM EQUALIZER (R11) AND EQUALIZER INSERT (ITEM 7) SLING POSTS.

CONNECT BOOM STRAPS/LINKS FROM BOOM TOP (ITEM 8) TO EQUALIZER INSERT (ITEM 7) IF NOT PREVIOUSLY DONE.

CONNECT EQUALIZER LINKS (R33) TO BOOM STRAPS (R13). REMOVE PINS SECURING EQUALIZER TO INSERT IF INSTALLED.

(PINS SECURING EQUALIZER TO INSERT (SEE DETAIL R) ARE ONLY REQUIRED WHEN CHANGING BOOM LENGTHS AND THE EQUALIZER IS NOT SUPPORTED BY AN ASSIST CRANE OR CONNECTED TO THE BOOM STRAPS).

CONNECT MAST COUNTERWEIGHT STRAPS TO LINKS ON VPC-MAX BEAM PER FIXED MAST ASSEMBLY INSTRUCTIONS 81025005 OR 84050187. BOOM UP TO DESIRED ANGLE.

SEE DELTA NOTE 35 (SHEET 1) AND RECOMMENDED BOOM MAKEUP CONFIGURATIONS (SHEETS 4 & 5) FOR BOOM BLOCKING RESTRICTIONS

**PROCEDURE TO DISASSEMBLE BOOM**

1. BOOM DOWN AND SUPPORT BOOM ON BLOCKING.
2. BOOM FIXED MAST (R10 OF R15) 1° TOWARD MAST STOPS AND DISCONNECT MAST COUNTERWEIGHT STRAPS FROM LINKS ON VPC-MAX BEAM.
3. PAY OUT BOOM HOIST TO LOWER EQUALIZER (R11) ONTO INSERT RAILS AND SECURE WITH EQUALIZER PIN. (SEE DETAIL R).
4. DISCONNECT LINKS (R33) FROM EQUALIZER STRAPS (R13) AND PIN LINKS (R33) INTO STORAGE POSITION.
5. DISCONNECT BOOM STRAPS/LINKS AT EACH JOINT.
6. WITH PROPER BLOCKING IN PLACE AND SUPPORT FROM ASSIST CRANE REMOVE INSERT LOWER CONNECTOR PINS AND DISENGAGE UPPER CONNECTOR PINS FROM INSERTS TOWARD BOOM TOP FROM EQUALIZER INSERT.

**WARNING:**

BOOM MUST BE PROPERLY BLOCKED TO PREVENT SHIFTING DURING PIN REMOVAL.

7. REMOVE PINS SECURING EQUALIZER TO INSERT IF INSTALLED.
8. FOR REMOVAL OF BOOM BUTT/EQUALIZER INSERT ASSEMBLY REVERSE INSTALLATION STEPS 1 THRU 5 ON SHEET 8.

**PROCEDURE TO DISASSEMBLE BOOM FOR BOOM MAKE UP RECONFIGURATIONS**

1. BOOM DOWN AND SUPPORT BOOM ON BLOCKING.
2. PAY OUT BOOM HOIST TO LOWER EQUALIZER (R11) ONTO INSERT RAILS AND SECURE WITH EQUALIZER PIN. (SEE DETAIL R).
3. DISCONNECT LINKS (R33) FROM EQUALIZER STRAPS (R13) AND PIN LINKS (R33) INTO STORAGE POSITION.
4. DISCONNECT BOOM STRAPS/LINKS NECESSARY FOR BOOM RECONFIGURATION.
5. WITH PROPER BLOCKING IN PLACE AND SUPPORT FROM ASSIST CRANE REMOVE INSERT LOWER CONNECTOR PINS AND DISENGAGE UPPER CONNECTOR PINS PER REQUIRED CONFIGURATION.

**WARNING:**

BOOM MUST BE PROPERLY BLOCKED TO PREVENT SHIFTING DURING PIN REMOVAL.

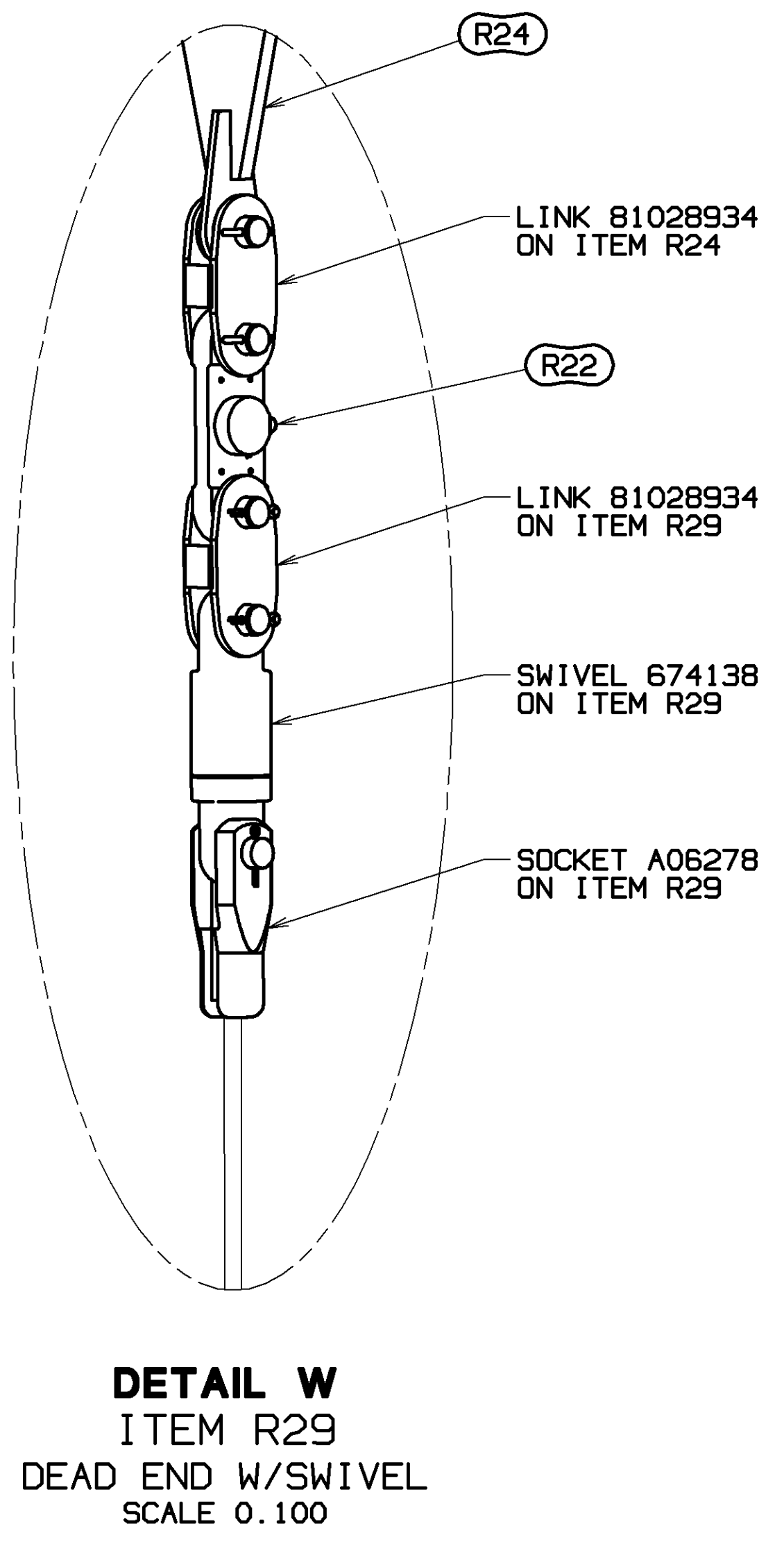
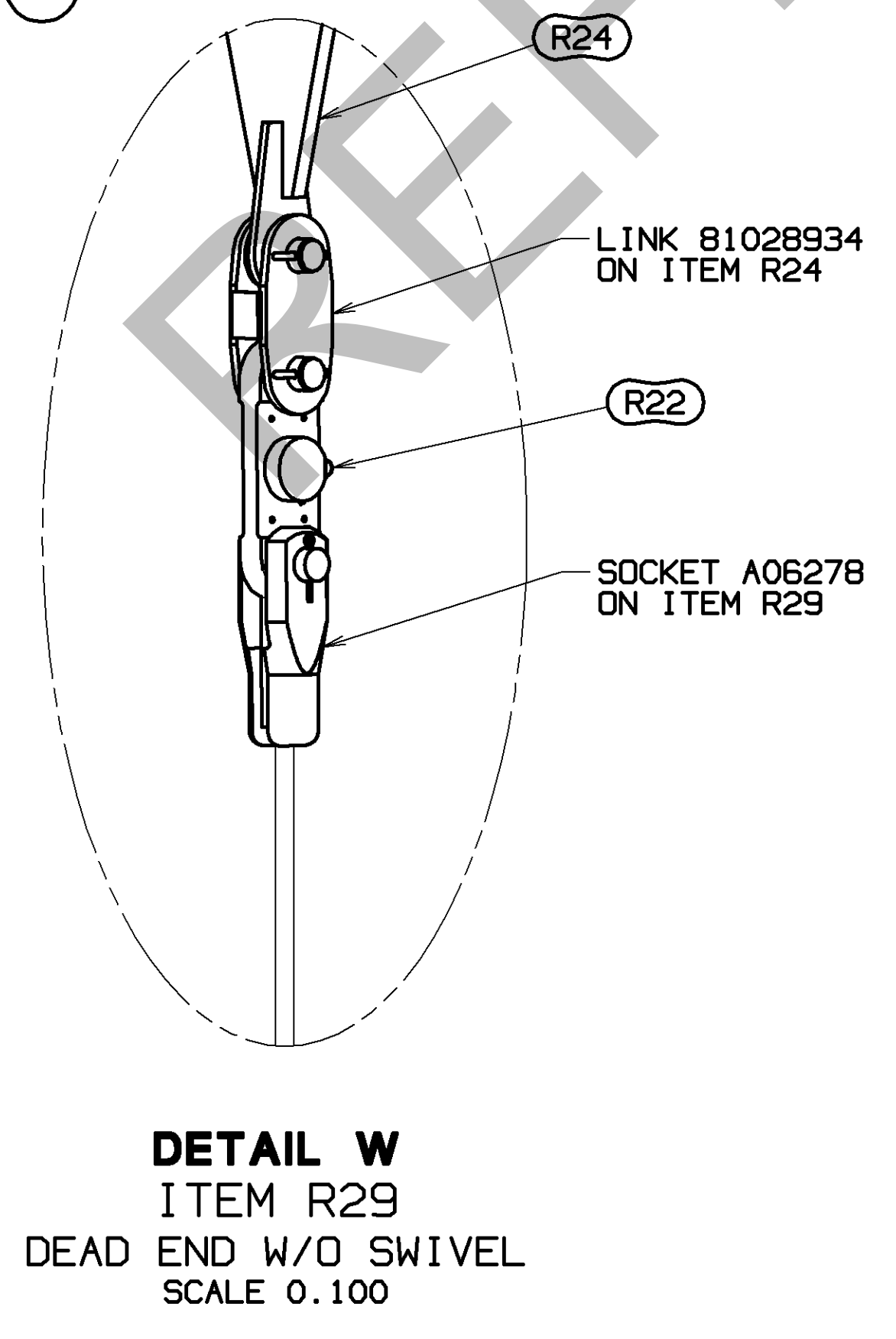
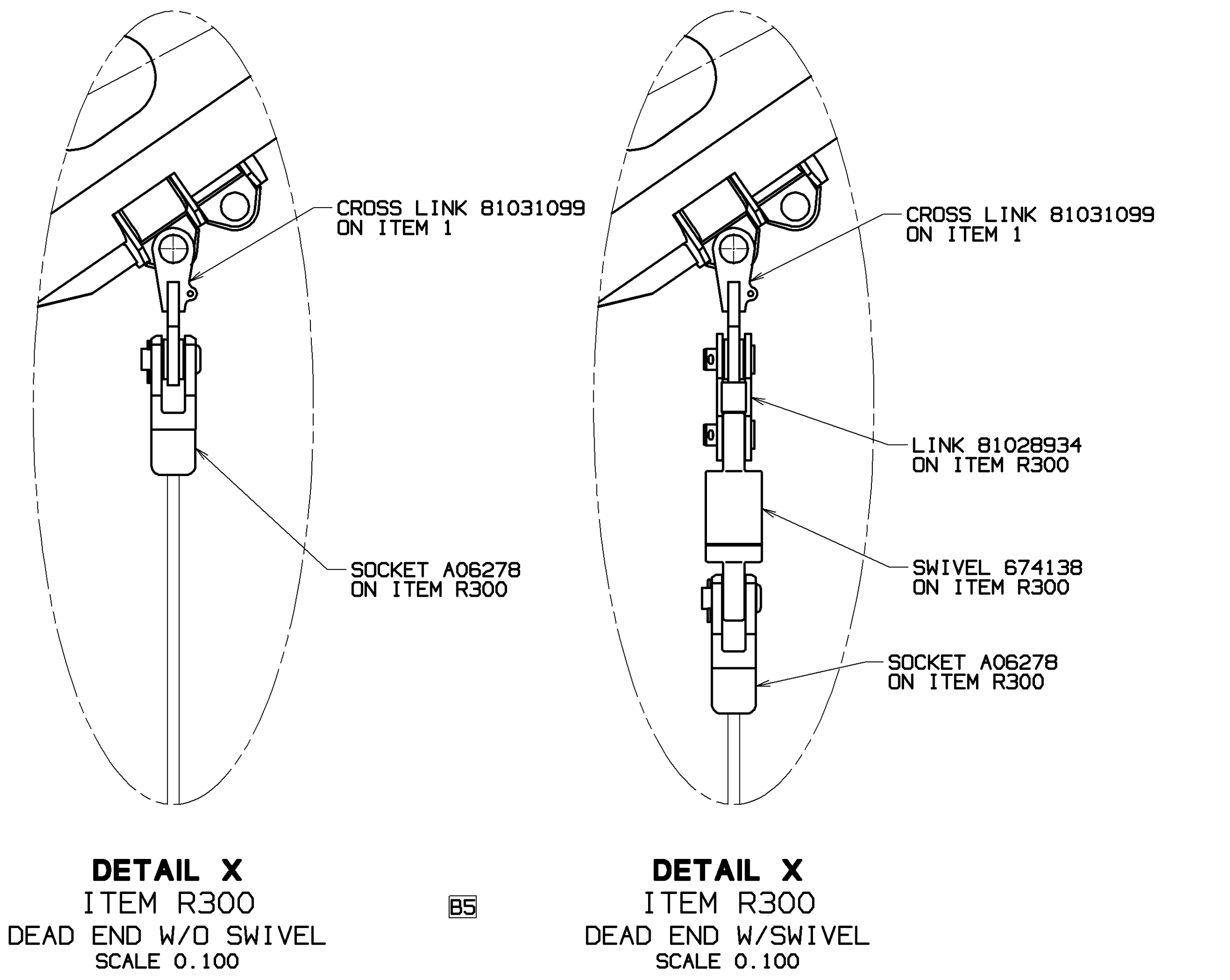
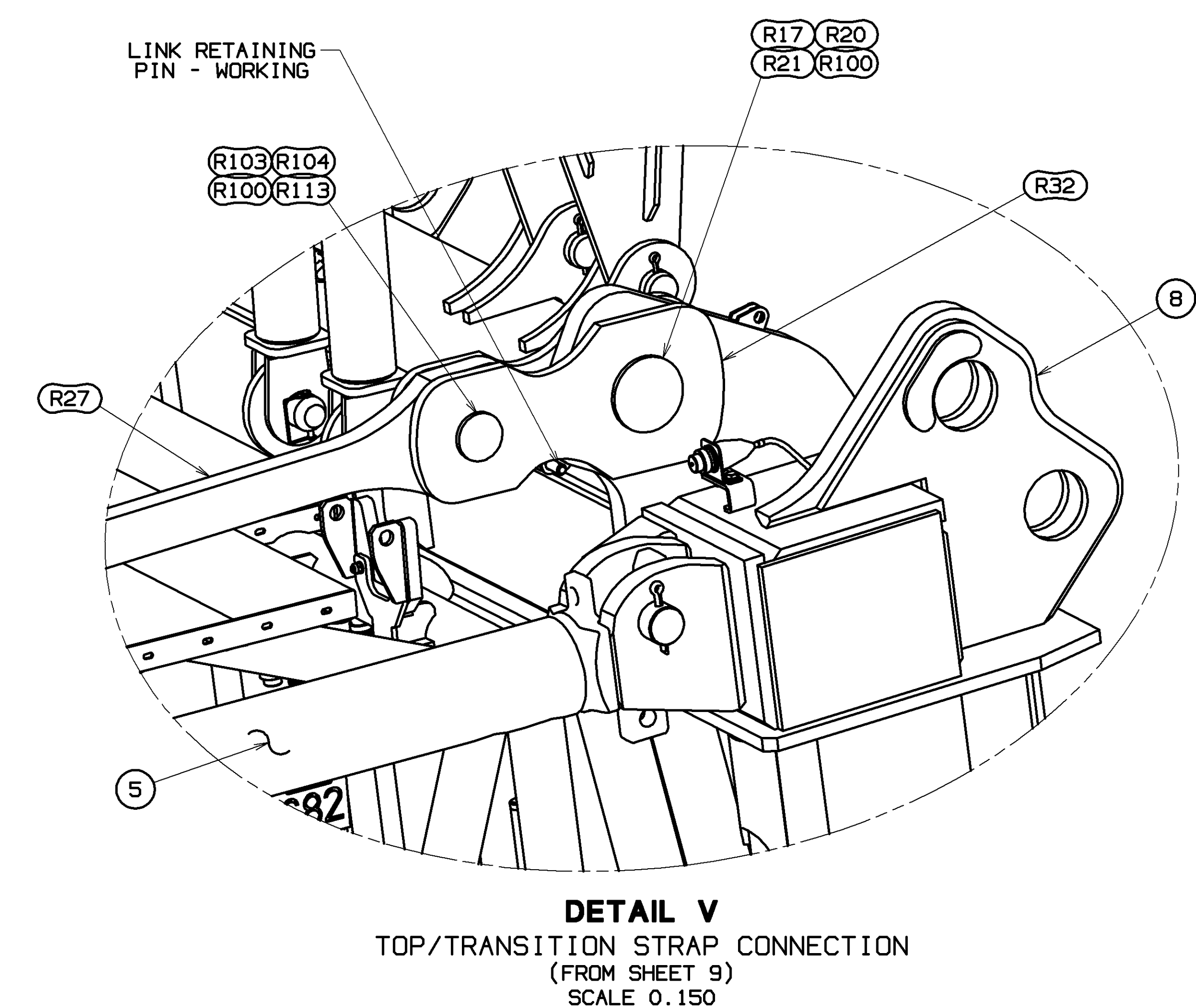
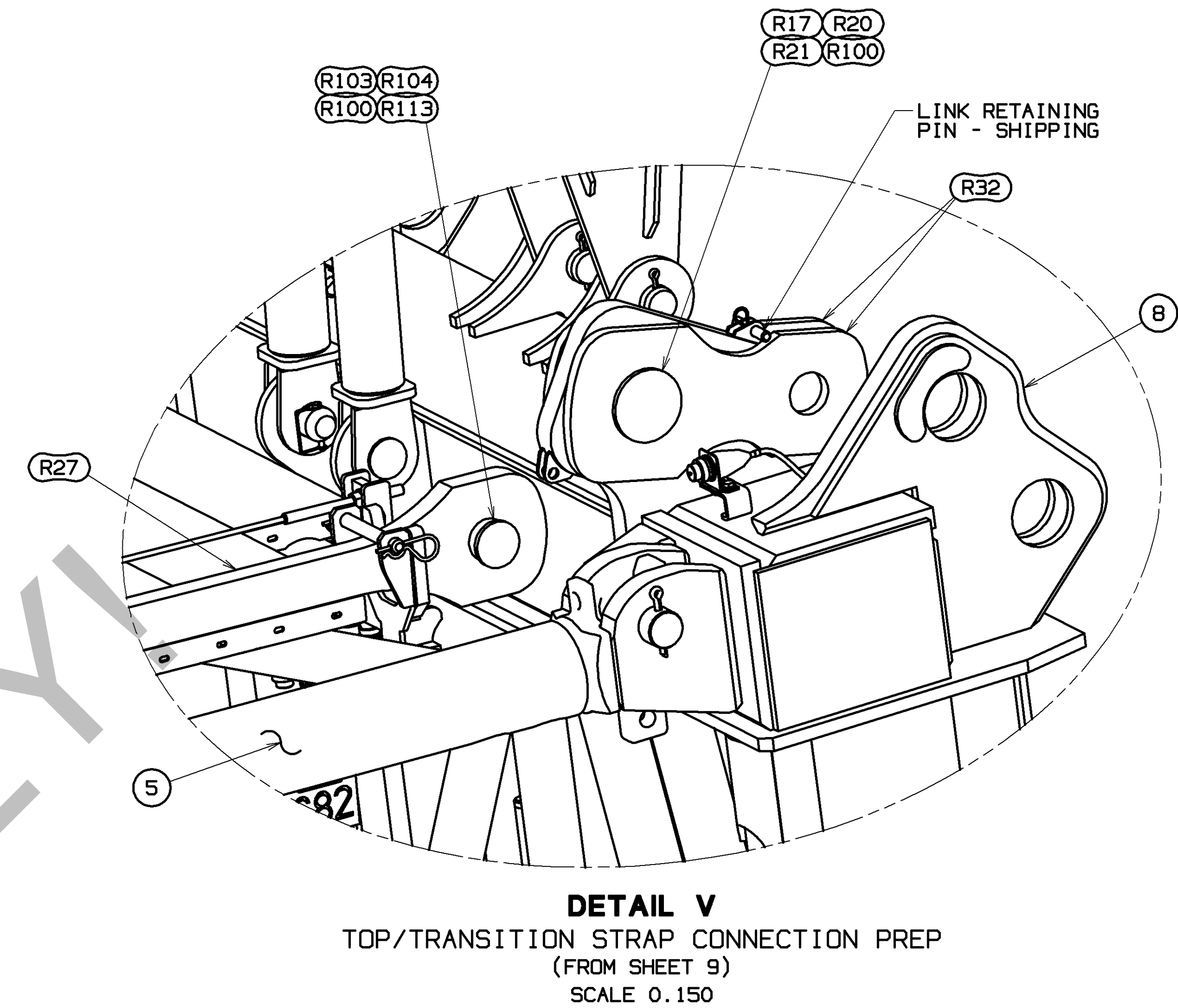
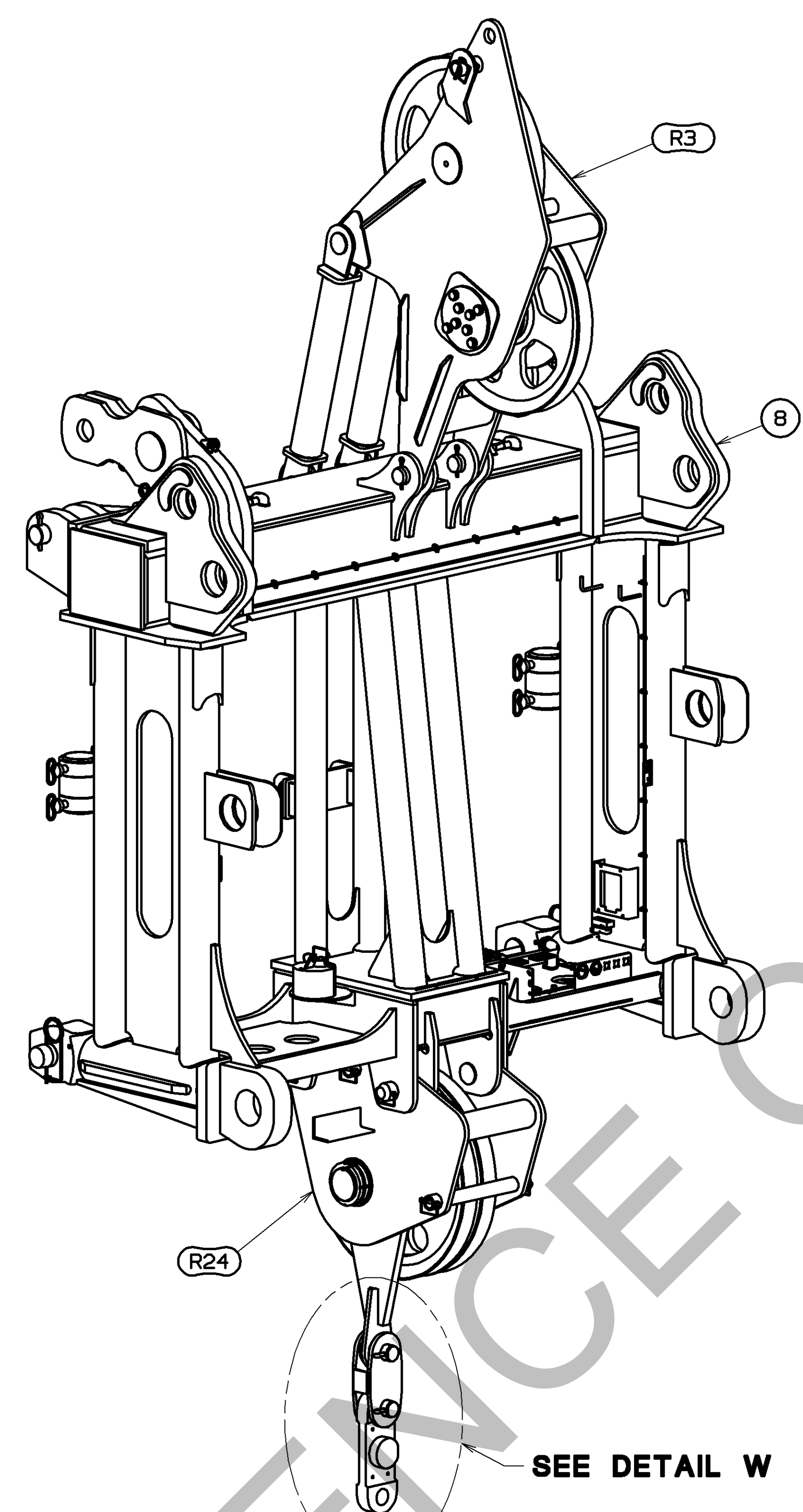
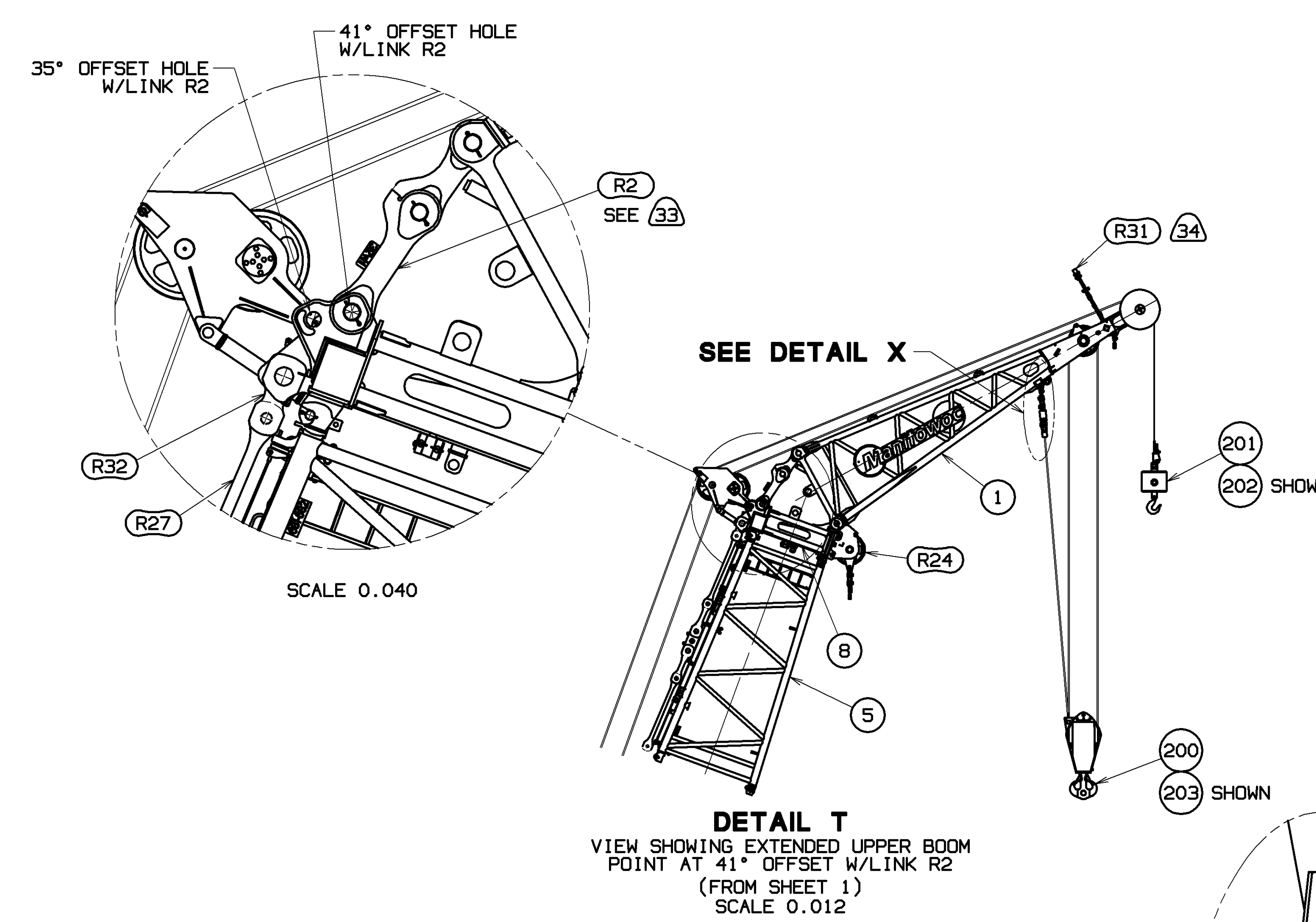
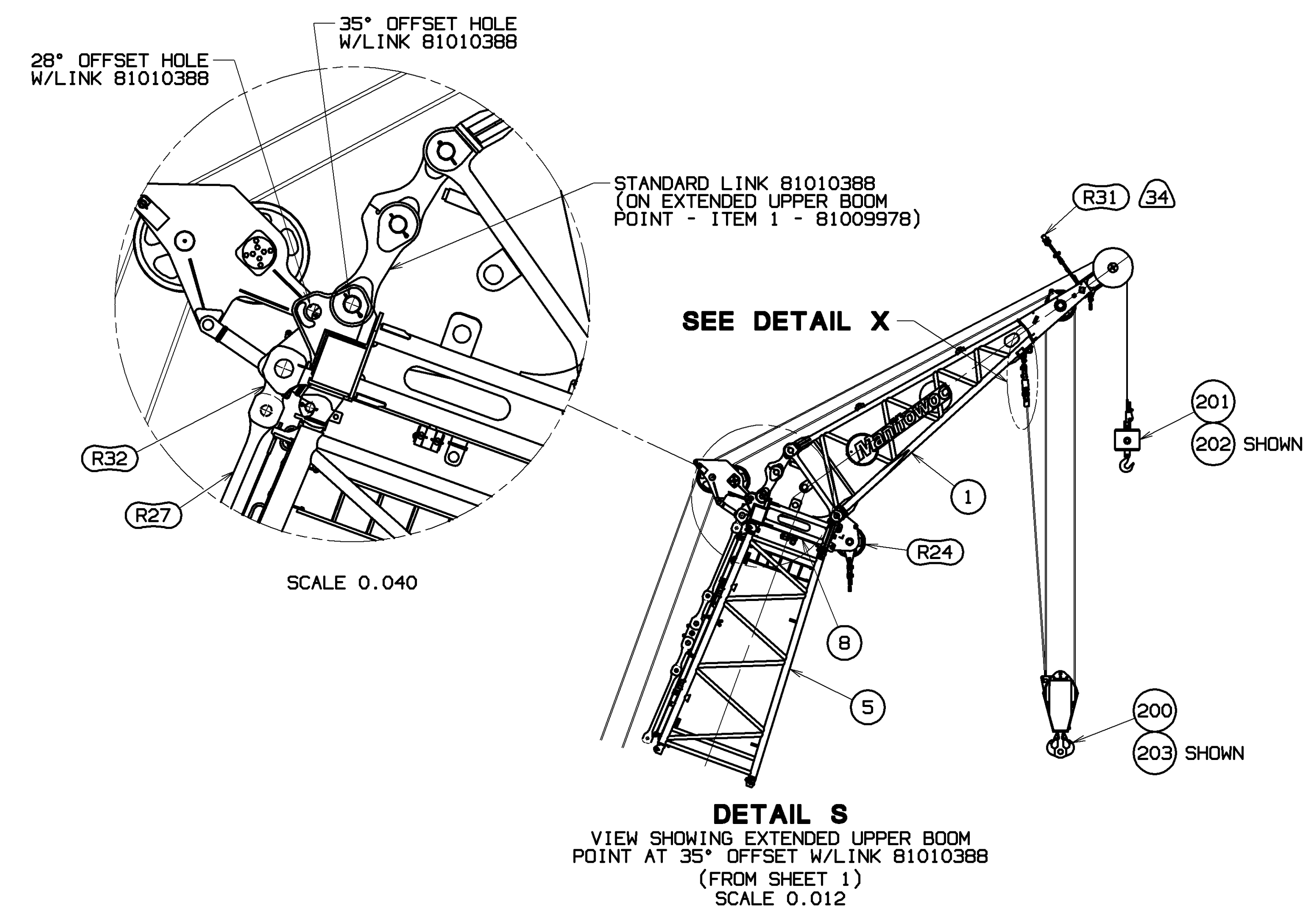
SCALE THIS DRAWING

C14

TOLERANCE UNLESS OTHERWISE SPECIFIED		MATERIAL		FINISHING		MATERIAL	
DECIMAL PLACES	FRACTIONS	DR. AUB	DR. RHY	DR. RHY	DR. RHY	DR. RHY	DR. RHY
1) PLACE 0.0	1/16	1/16	1/16	1/16	1/16	1/16	1/16
2) PLACE 0.00	1/32	1/32	1/32	1/32	1/32	1/32	1/32
3) PLACE 0.000	1/64	1/64	1/64	1/64	1/64	1/64	1/64

PRIVATE LABELING REQUIREMENT TO CONFORM TO ENGINEERING SPECIFICATION 822103794 FOR COMPONENTS LISTED IN SECTION 05-026  
 DATE 03-16-16  
 REF. LNK. D  
 81022864  
 SHT 9 OF 11





BOOM TOP ASSY LINKS TO TRANSITION INSERT STRAP INSTALLATION (SEE DETAIL V-TOP/TRANSITION STRAP CONNECTION PREP)

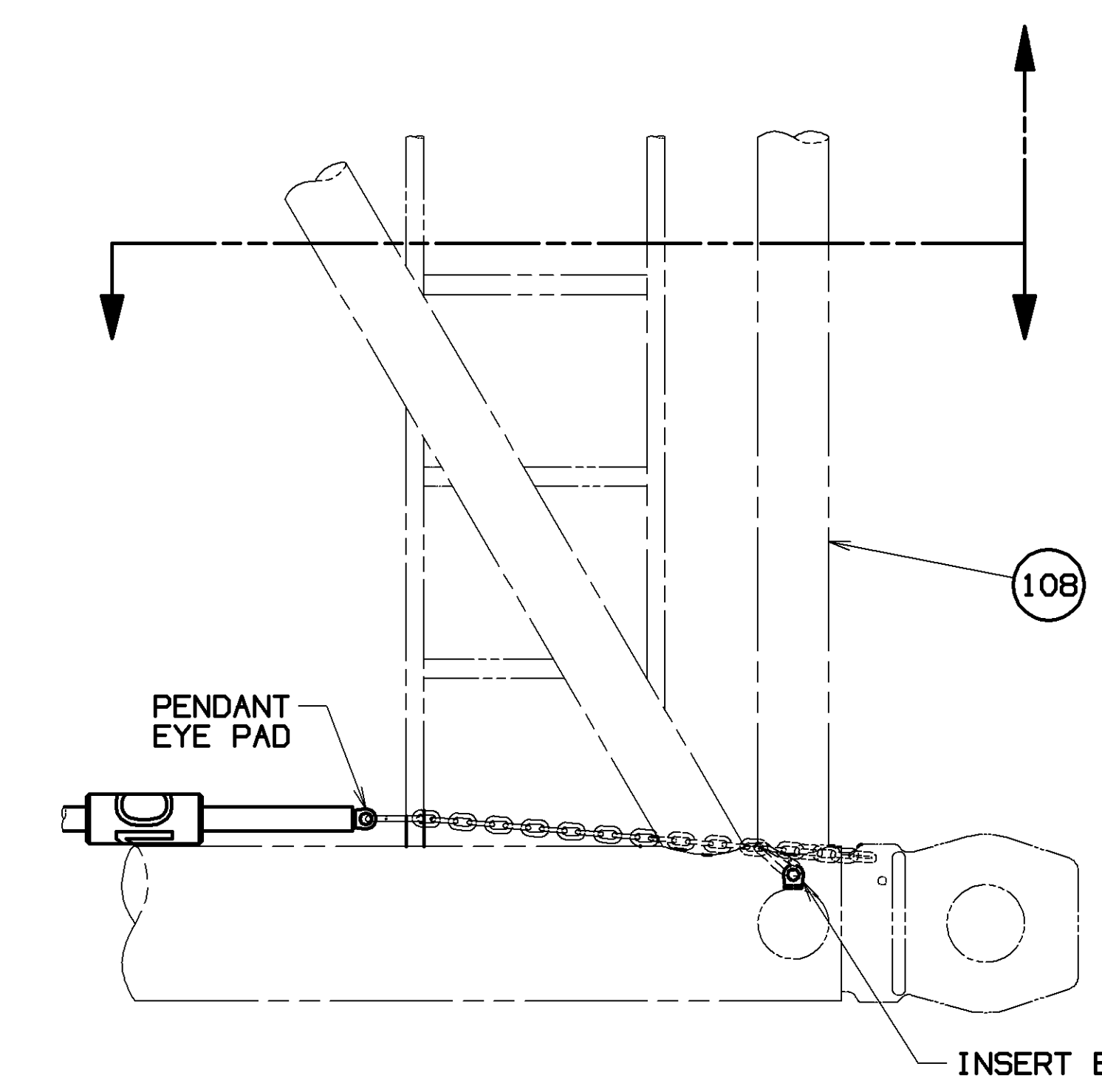
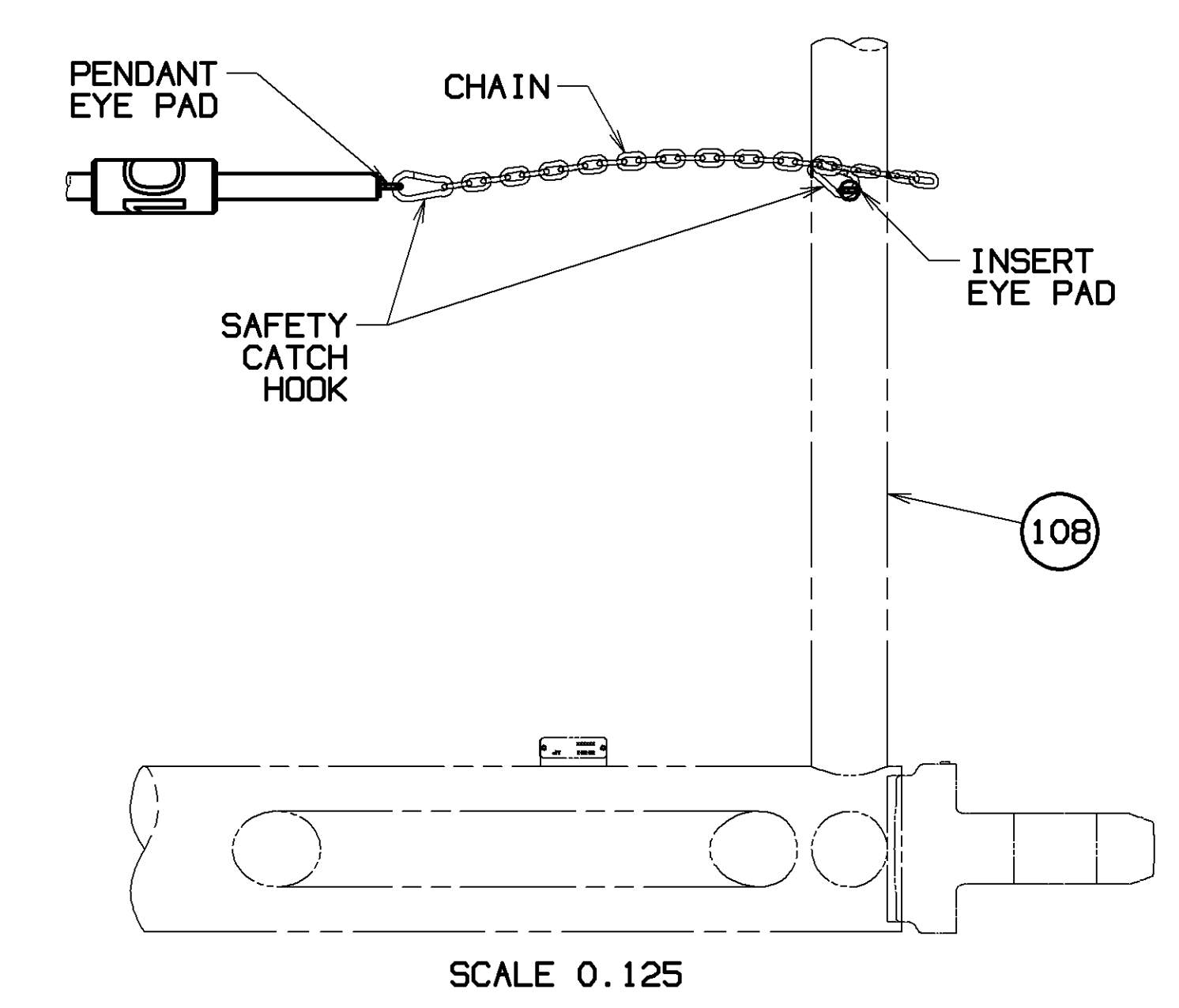
- WITH STRAP AND LINKS IN STOWAGE POSITION REMOVE LINK RETAINING PIN FROM SHIPPING POSITION ON TOP ASSY ITEM 8.
- RELOCATE LINK RETAINING PIN TO WORKING POSITION.
- ROTATE LINKS (R32) TO REST ON LINK RETAINING PIN.
- ELEVATE STRAP (R27) TO PIN HOLES AND INSTALL PIN (R103), COLLAR (R104), PIN (R113) AND COTTERS (R100).

REVERSE INSTALLATION STEPS 1 THRU 4 TO RETURN TO SHIPPING POSITION.

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BILL OF MATERIAL				ASSEMBLIES USED ON
QTY	DESCRIPTION	MATERIAL	QTY	NO.



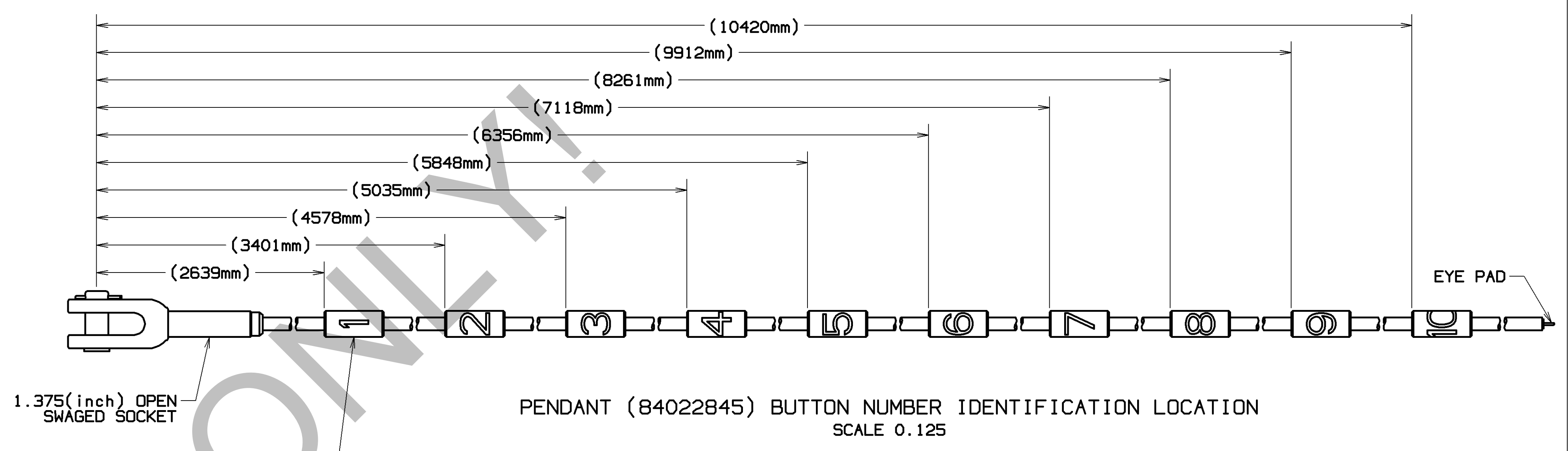
**DETAIL Z - STOWED SHIPPING**  
 SUSPENSION WIRE ROPE #680  
 ITEM R112, 81036355  
 (FROM SHEET 3)  
 SUSPENSION PENDANTS STOWED POSITION FOR SHIPPING  
 OR WHEN INSERT WORKING W/O SUSPENSION  
 SCALE 0.125

**INTERMEDIATE SUSPENSION (R112) INSTALLATION**

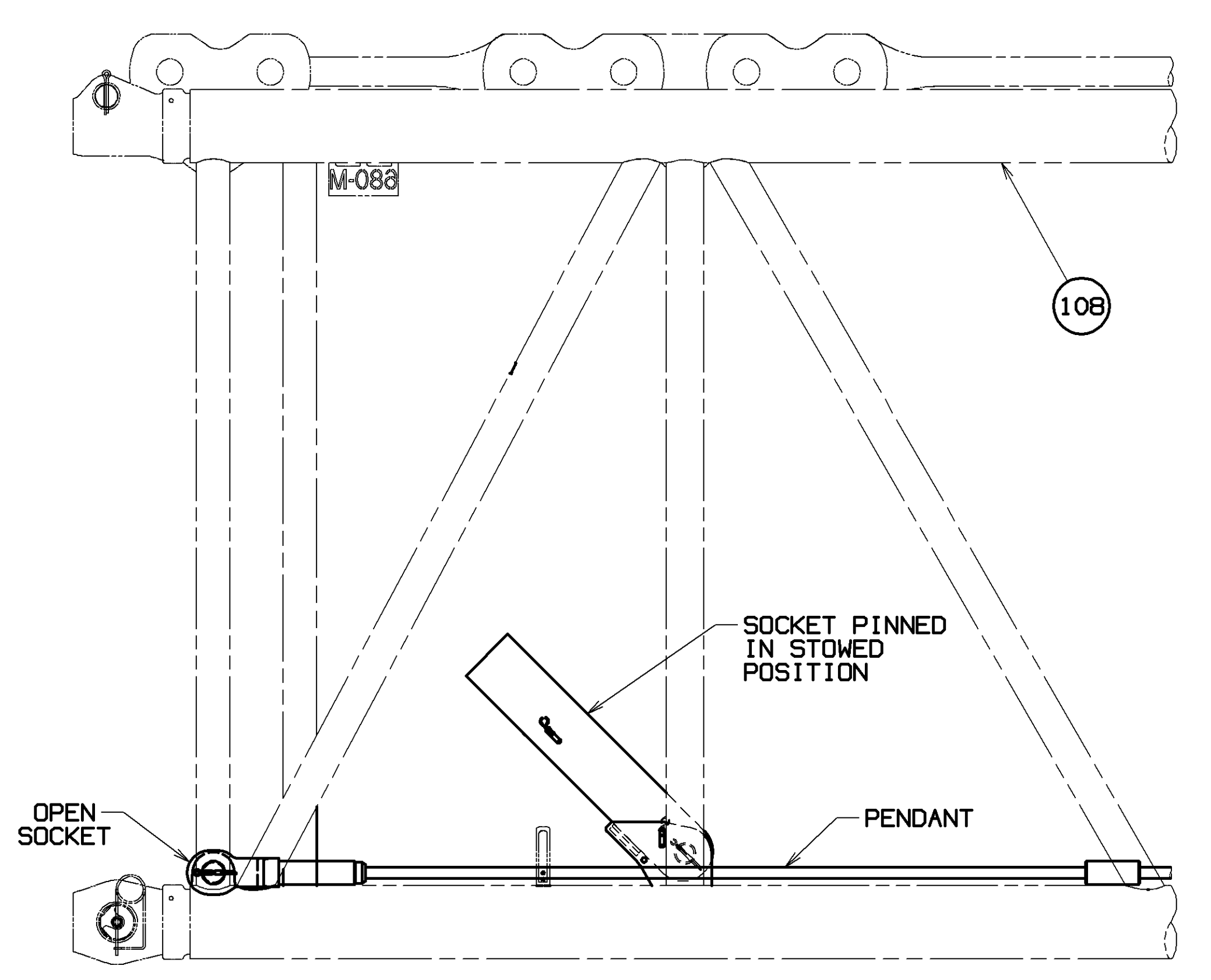
SEE BOOM MAKEUP VIEWS ON SHEETS 3, 4 & 5 AND BOOM LENGTH TABLE ON SHEET 2 FOR REQUIRED SUSPENSION & WIRE ROPE BUTTON IDENTIFICATION LOCATION.

1. REMOVE MULTI-BUTTON PENDANT FROM STOWED SHIPPING POSITION. (SEE DETAIL Y & Z)
2. ATTACH OPEN SOCKET END OF PENDANT TO CONNECTING LINK R109 AT TOP OF INSERT ITEM 10B. (SEE DETAIL AA-PREPARED NON-WORKING)
3. SLOWLY RAISE BOOM. AS THE STRAPS RISE, GUIDE THE INTERMEDIATE SUSPENSION PENDANTS THROUGH THE OPENINGS IN THE BOOM INSERT. STOP THE BOOM RAISING PROCEDURE WHEN THE REQUIRED PENDANT BUTTON NEARS THE SOCKET. FROM STOWED POSITION REMOVE BUTTON RETAINING HITCH PIN FROM SOCKET AND POSITION THE IDENTIFIED PENDANT BUTTON INTO SOCKET. REINSTALL BUTTON RETAINING HITCH PIN INTO SOCKET, LOCKING PENDANT IN POSITION. (SEE DETAIL AA-PREPARED NON-WORKING)
4. RELOCATE SOCKET LOCKING HITCH PIN TO LOWER BRACKET HOLE. (SEE DETAIL AA-WORKING)
5. ATTACH PENDANT EYE PAD TO INSERT EYE PADS USING A SAFETY CATCH HOOK AT EACH END OF CHAIN. ADJUST PENDANT TENSION BY POSITIONING SAFETY CATCH HOOK IN APPROPRIATE CHAIN LINK. (SEE DETAIL BB)
6. BOOM UP SLOWLY AS PENDANT BECOMES TIGHT AND SOCKET PIVOTS INTO WORKING POSITION. (SEE DETAIL AA-WORKING)

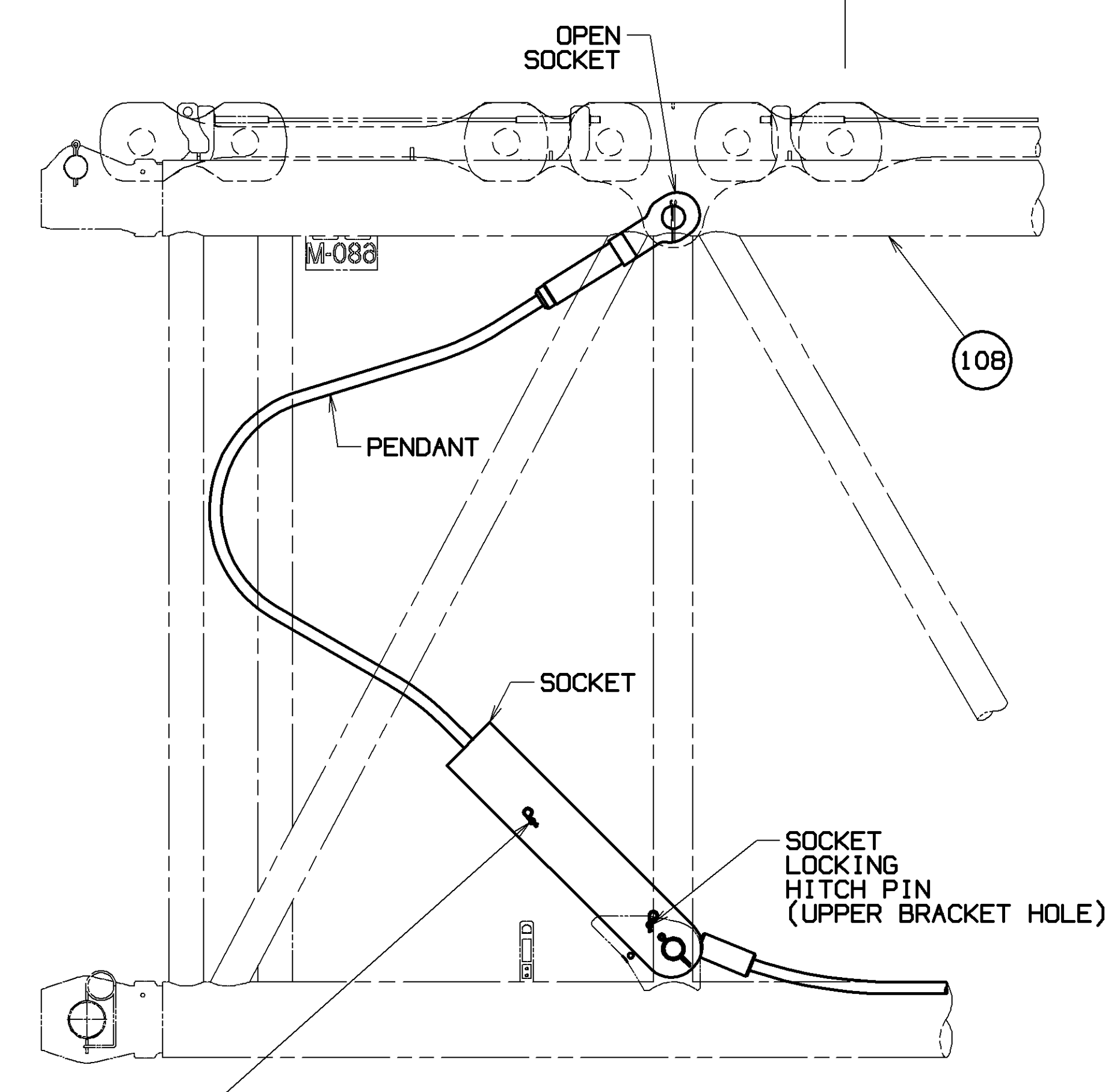
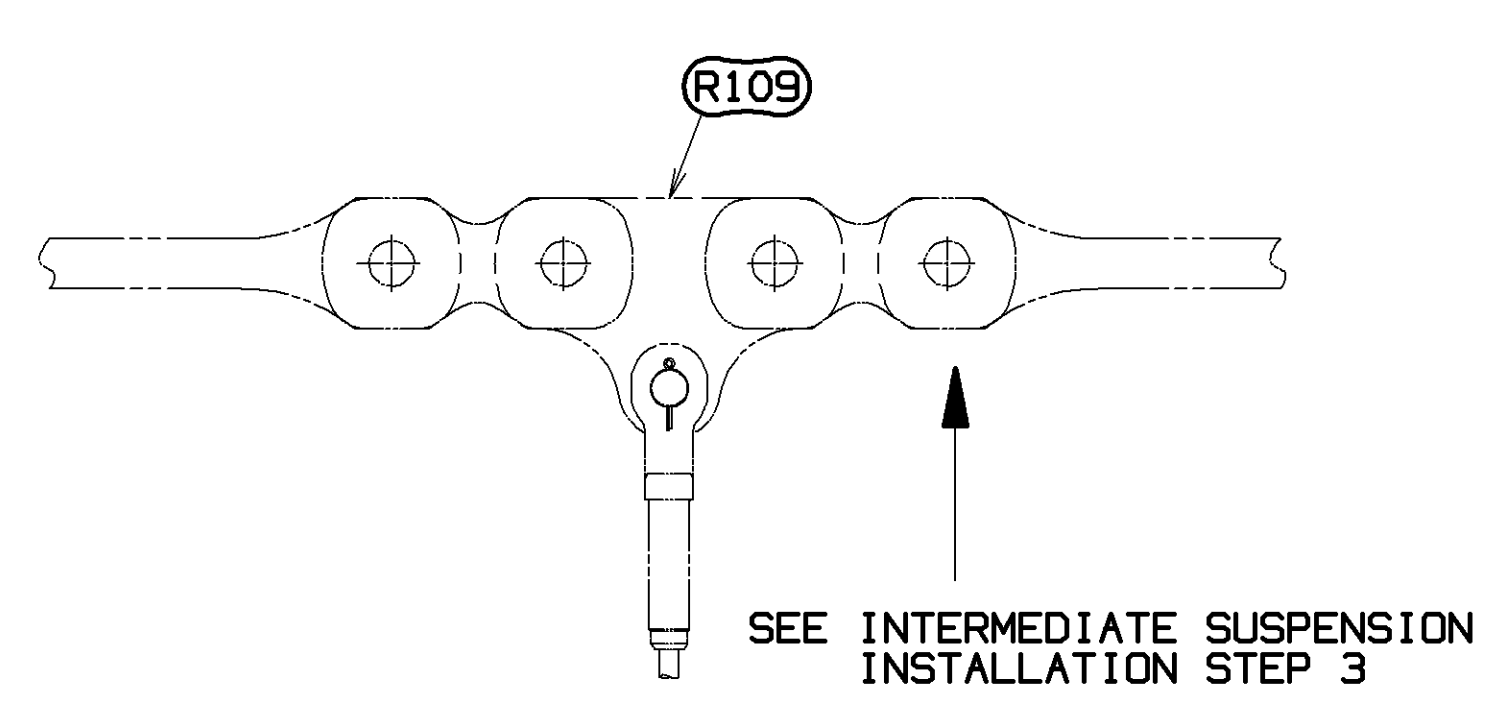
FOR REMOVAL OF INTERMEDIATE SUSPENSION REVERSE INSTALLATION STEPS 1 THRU 6, ASSURING SOCKET PIVOTS TOWARD STORAGE POSITION.  
 VERIFY THAT SLACK IN PENDANT CHAIN ALLOWS FOR SOCKET TO PIVOT INTO STOWED POSITION.



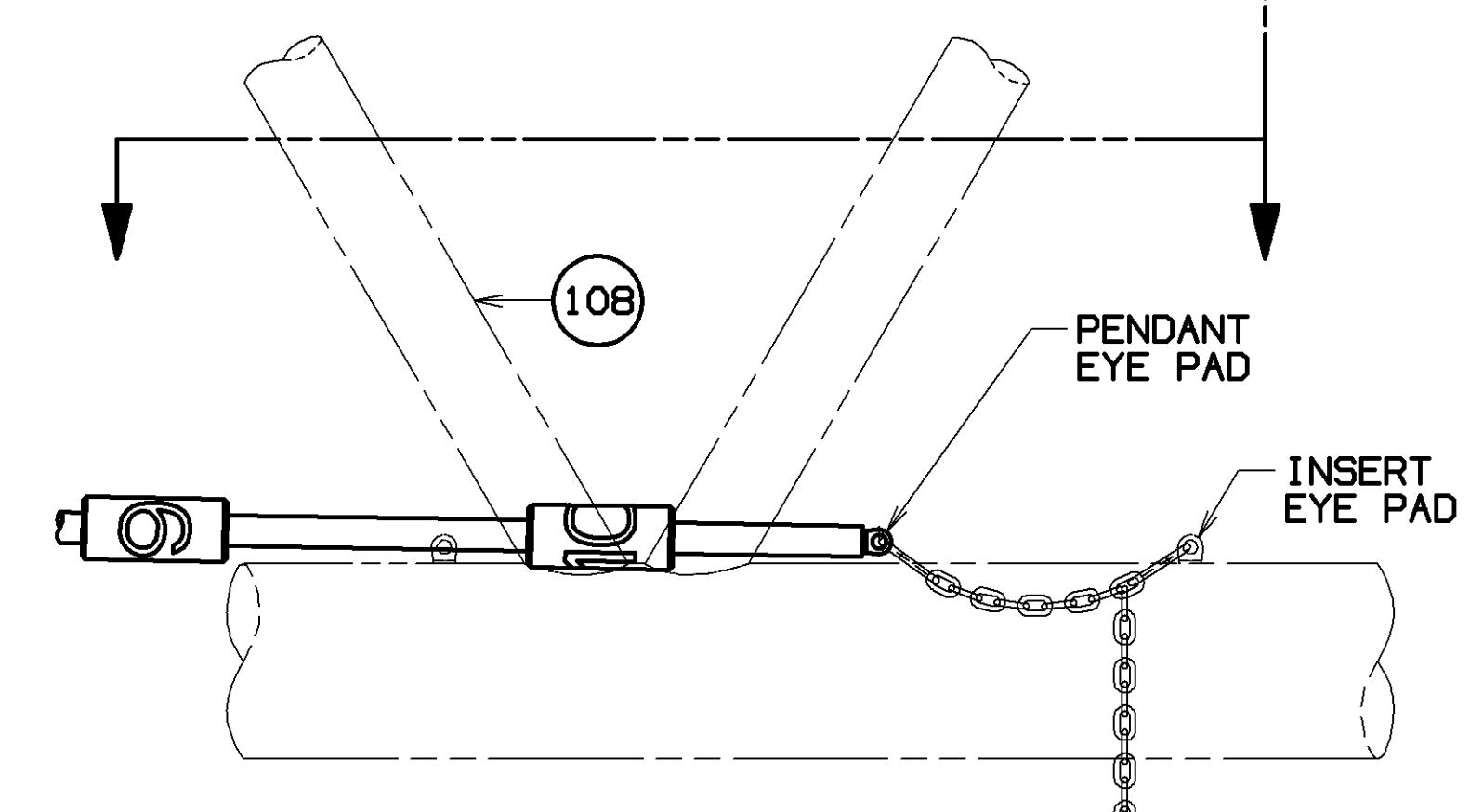
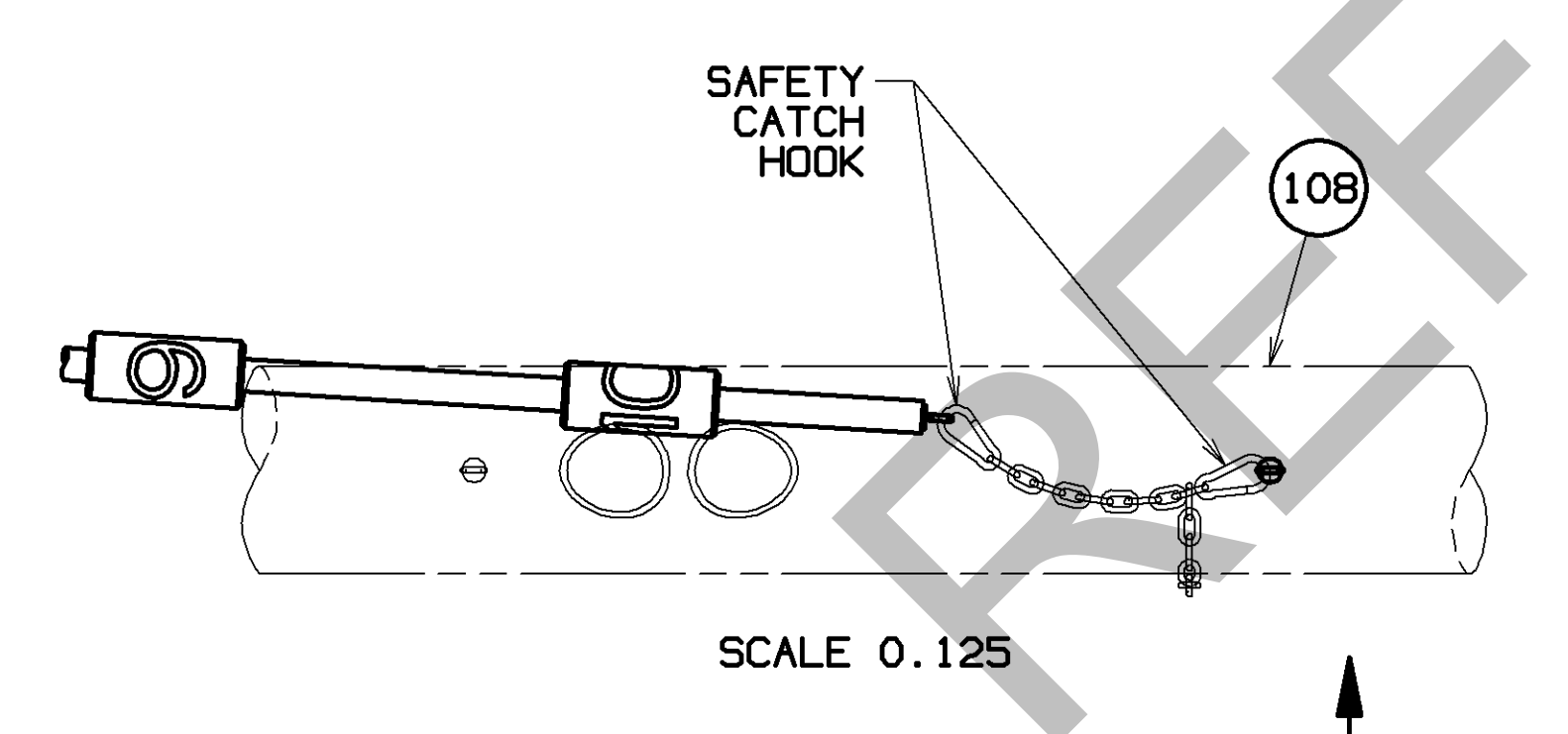
1.375(inch) OPEN SWAGED SOCKET  
 INTERMEDIATE SUSPENSION PENDANT BUTTON NUMBER IN ASCENDING ORDER FROM OPEN SOCKET END  
 PENDANT (84022845) BUTTON NUMBER IDENTIFICATION LOCATION  
 SCALE 0.125



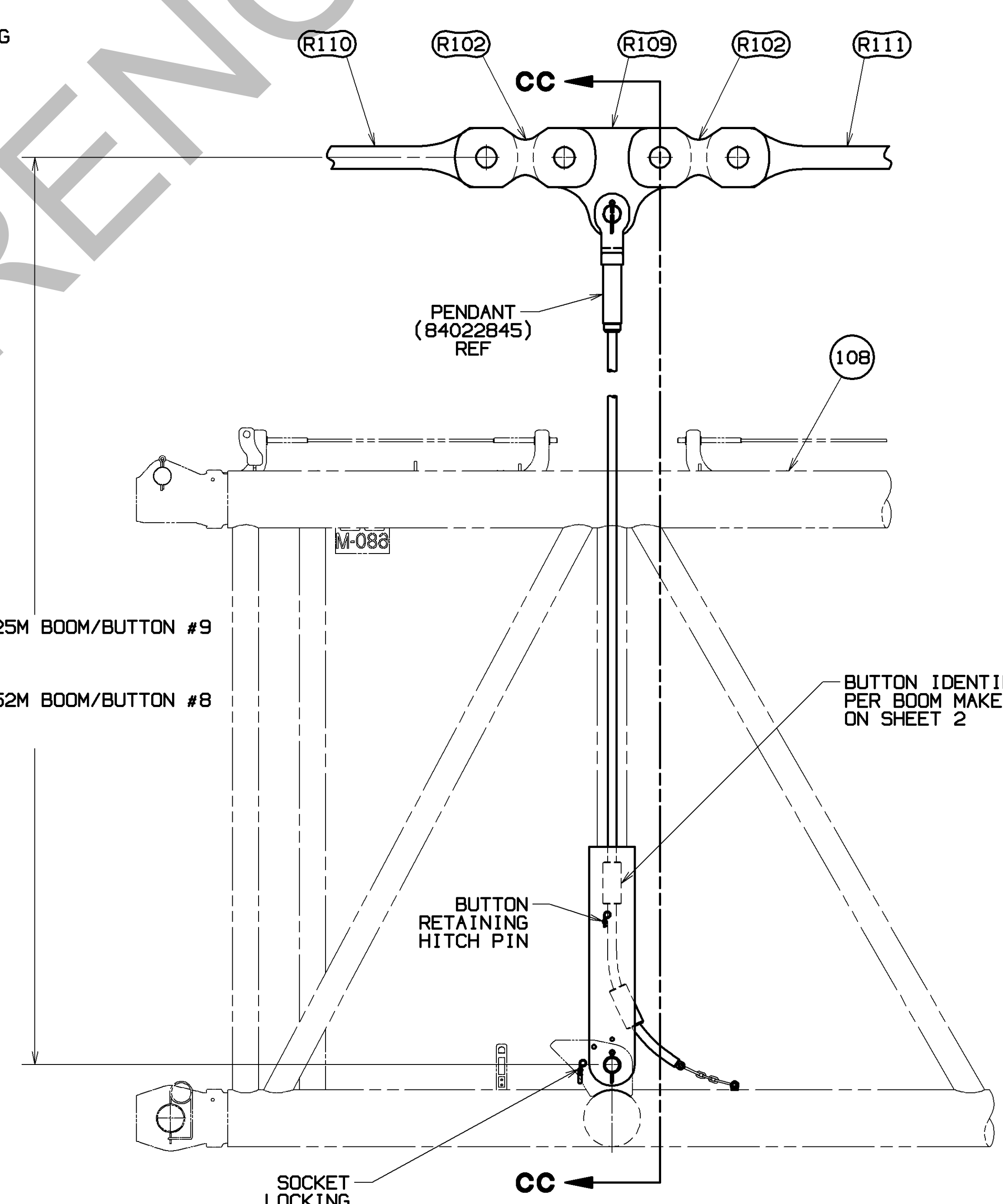
**DETAIL Y - STOWED SHIPPING**  
 SUSPENSION WIRE ROPE #680  
 ITEM R112, 81036355  
 (FROM SHEET 3)  
 SUSPENSION PENDANTS STOWED POSITION FOR SHIPPING  
 OR WHEN INSERT WORKING W/O SUSPENSION  
 SCALE 0.075



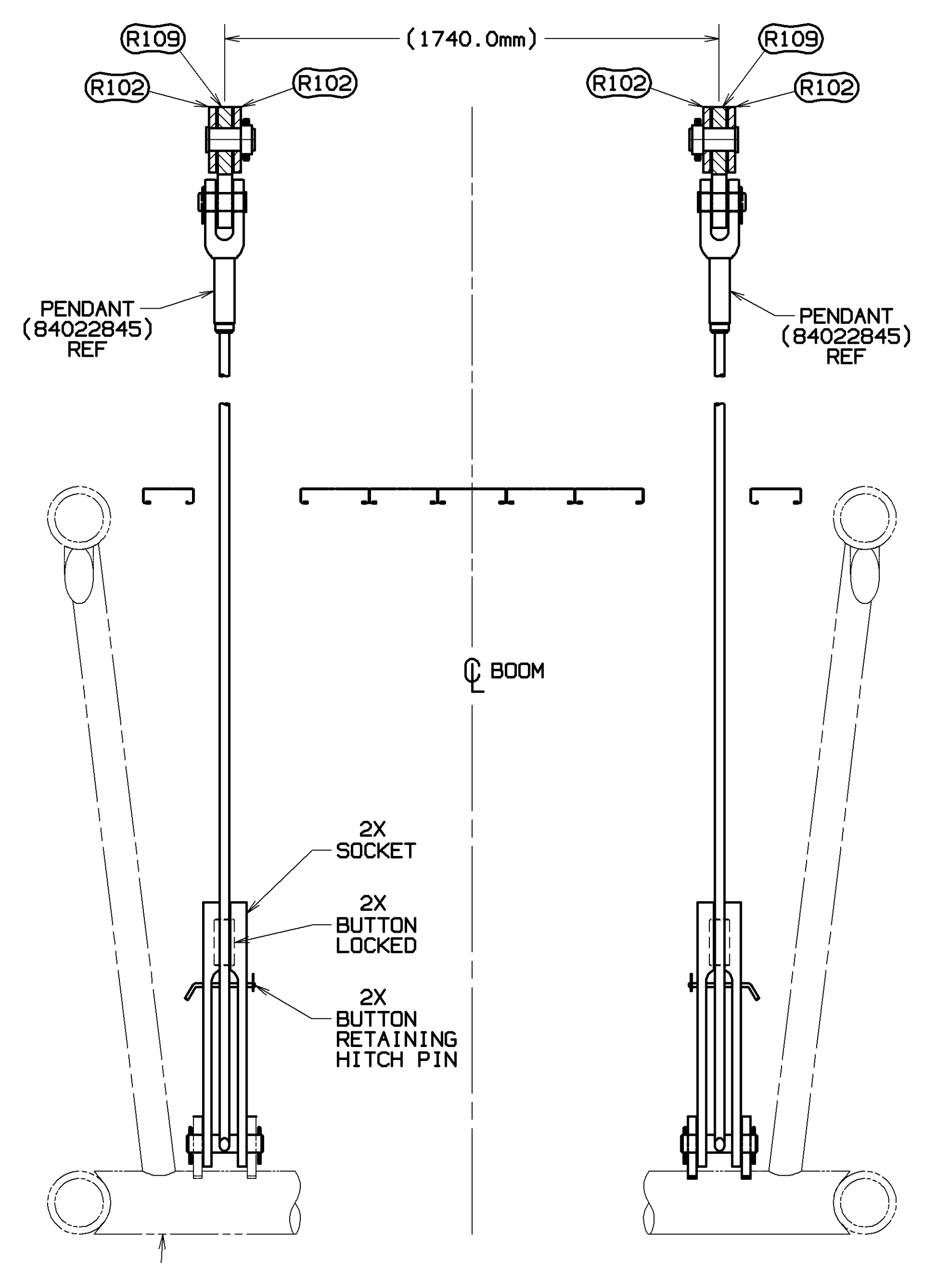
**DETAIL AA - PREPPED NON-WORKING**  
 SUSPENSION WIRE ROPE #680  
 ITEM R112, 81036355  
 (FROM SHEET 4)  
 SUSPENSION SOCKET & ROPE LOCATION FOR  
 PREPPED NON-WORKING BOOM LENGTHS 110M THRU 152M  
 SCALE 0.075



**DETAIL BB**  
 SUSPENSION WIRE ROPE #680  
 ITEM R112, 81036355  
 (FROM SHEET 4)  
 SUSPENSION SOCKET & ROPE LOCATION FOR  
 WORKING BOOM LENGTHS 110M THRU 152M  
 SCALE 0.125



**DETAIL AA - WORKING**  
 SUSPENSION WIRE ROPE #680  
 ITEM R112, 81036355  
 (FROM SHEET 4)  
 SUSPENSION SOCKET & ROPE LOCATION FOR  
 WORKING BOOM LENGTHS 110M THRU 152M  
 SCALE 0.075



**SECTION CC-CC**  
 SCALE 0.075

81022864  
 SHT 11 OF 11

PRIVATE LABELING REQUIREMENT TO CONFORM TO ENGINEERING SPECIFICATION 8829103794 FOR COMPONENTS LISTED IN 882900-09-006  
 DATE 03-16-16  
 REF. LIT. [D]  
 81022864  
 SHT 11 OF 11

DECIMAL PLACES	FABRICATION			MATERIAL	QTY	NO.
	1	2	3			
(1) PLACE 0.5	±.12	±.18	±.25			
(2) PLACE 0.00	±.08	±.12	±.15			
(3) PLACE 0.000	±.008	±.012	±.015			

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