FORUM HOLZBAU INTERNATIONAL
5.-7. Dezember 2018

STRUCTURLAM
Intelligence In Wood

SHANE HOMES YMCA, ROCKY RIDGE

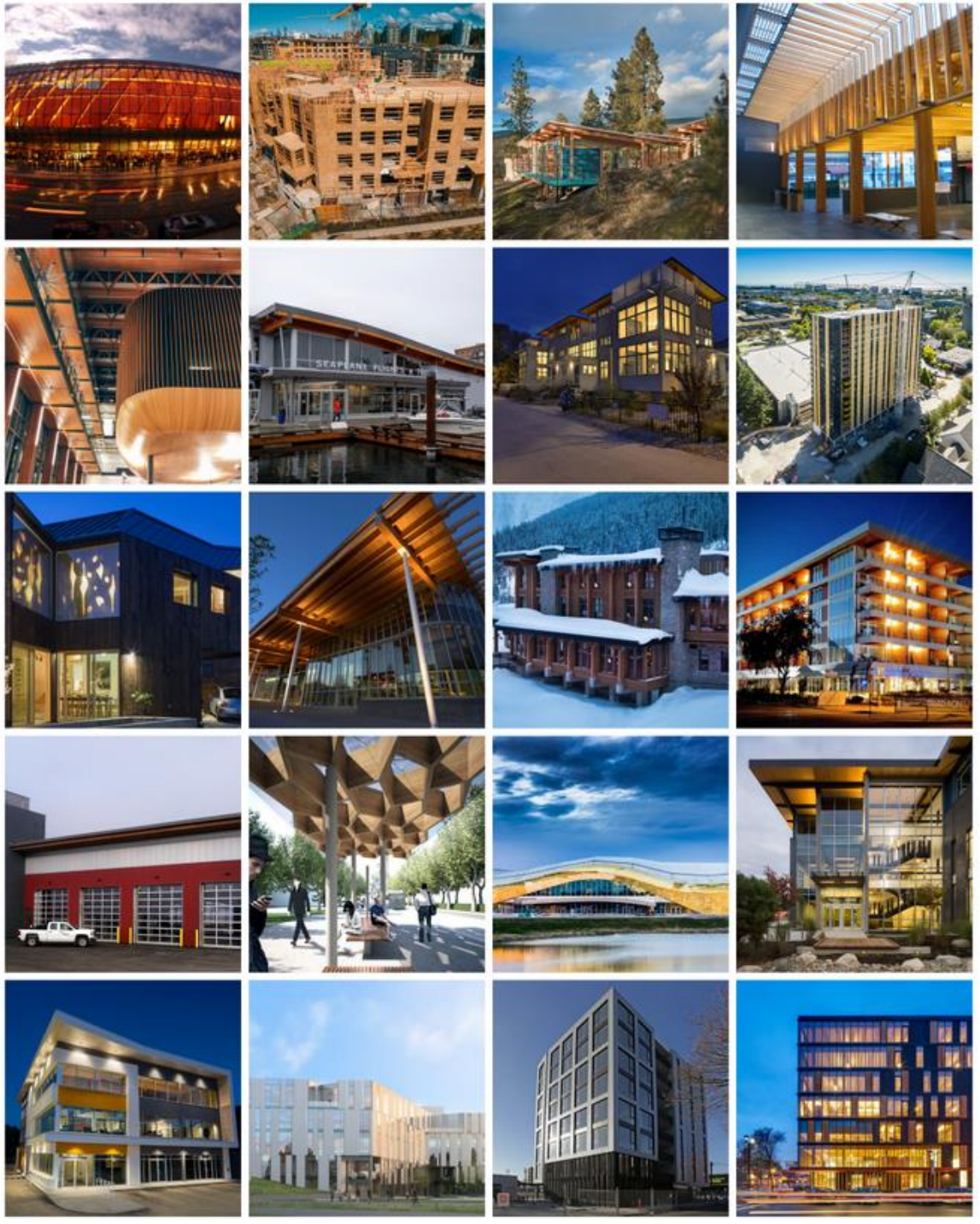
Calgary, AB, Canada

& other Projects of Interest

Nicholas Sills, Msc.

INTRODUCTION

1. **Architectural Design Overview**
   The Mass Timber Concept
2. **Building Scale**
3. **Project Deployment**
   Unique project deployment route
4. **Engineering**
   Specialty engineering solutions
5. **Fabrication & Installation**
6. **Summary**
7. **Other Projects**



Shane Holmes YMCA Rocky Ridge Recreation

Calgary, AB

- Largest Freeform timber roof structure in North America: 26,300 m^2 roof area, 2850 m^3 of glulam
- Pre-engineered purlin to glulam connections used for quick install
- Fully coordinated BIM system
- Large moment splices to save costs

PROJECT TEAM

gec architecture

STRUCTURLAM
Intelligence In Wood

ONWARD
Calgary

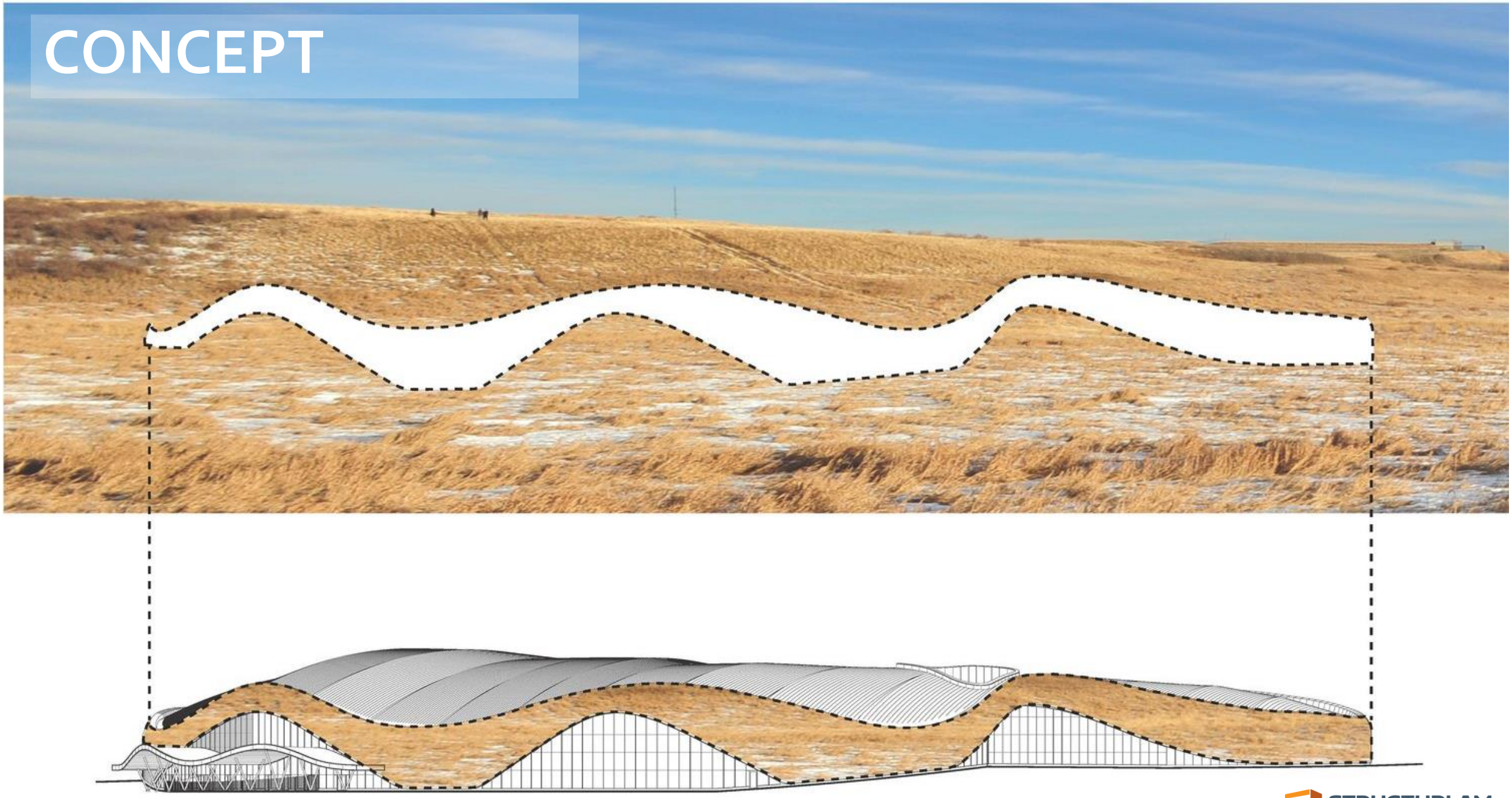
PCL
CONSTRUCTION

GLENMORE
FABRICATORS LTD

ISL

rjc
Read Jones Christoffersen
Consulting Engineers

CONCEPT

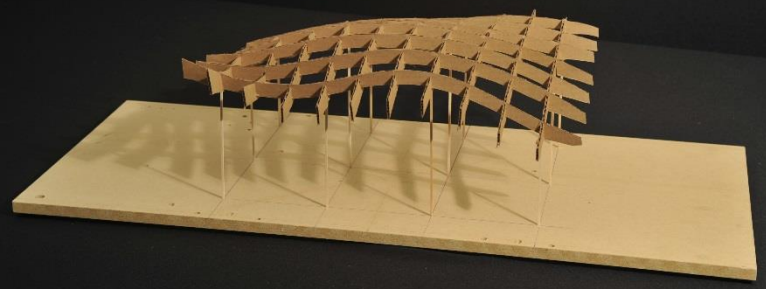


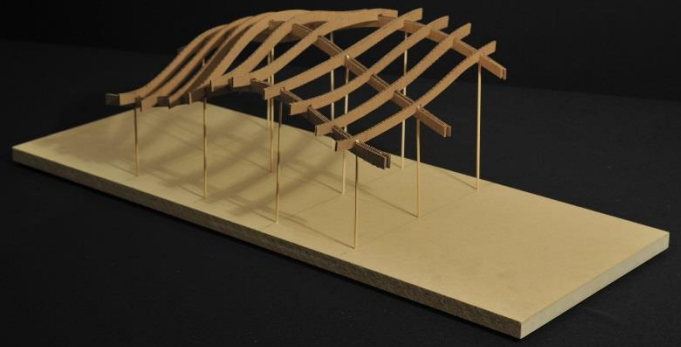
STRUCTURLAM
MASS TIMBER CORPORATION

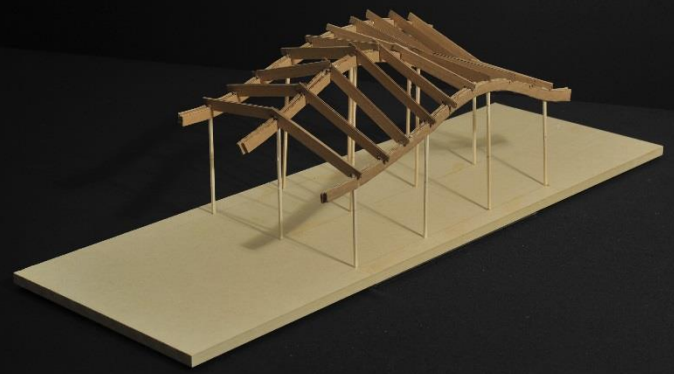
LAYOUT

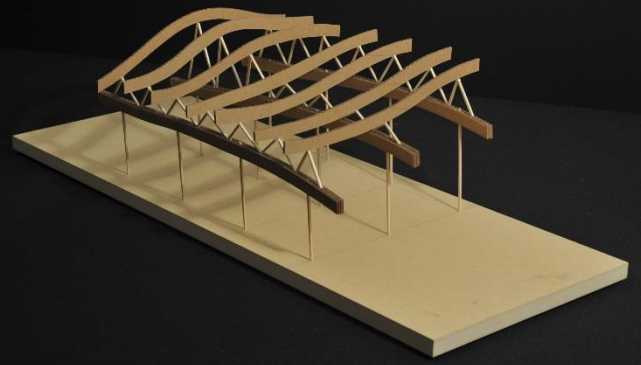
- Full Sized Ice Rink
- Children's Ice Rink
- Running Oval
- Theatre
- Three Basketball Courts
- Amenity Spaces
- 25 m Swimming Lanes
- Wave Pool / Water Park
- Library
- Public Offices

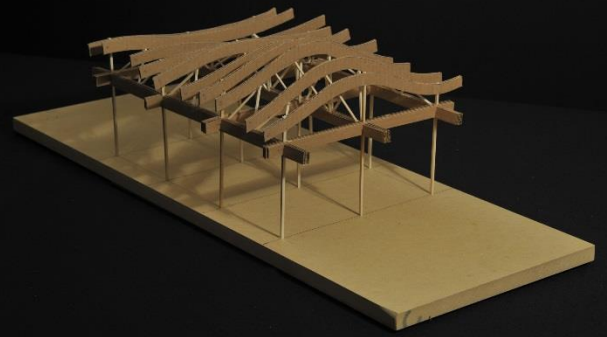
ROOF SYSTEMS

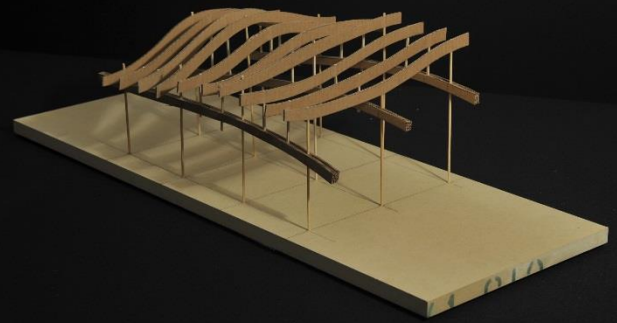


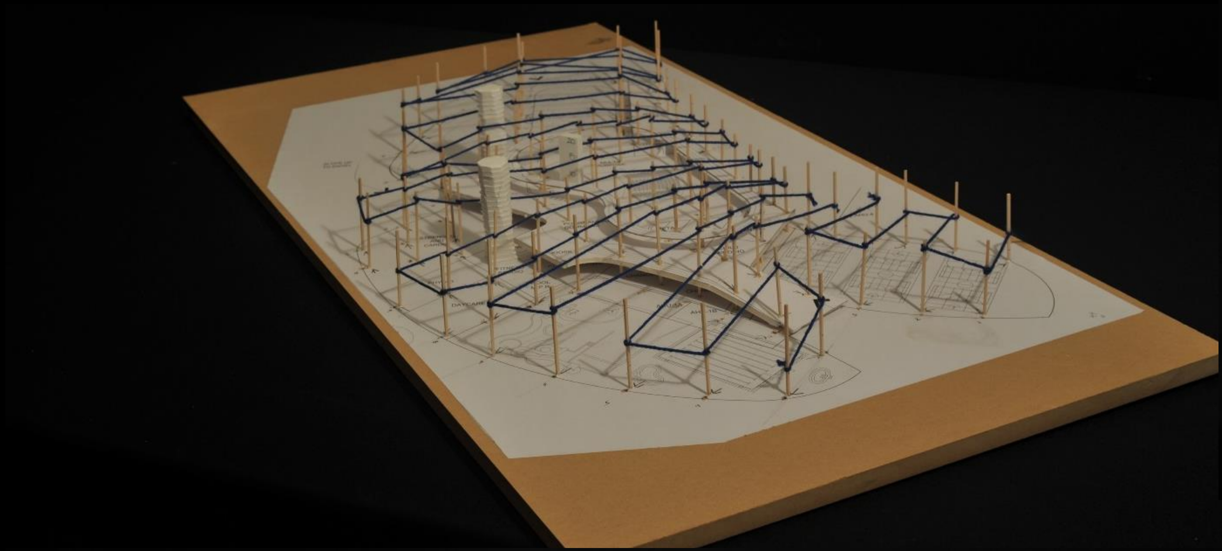


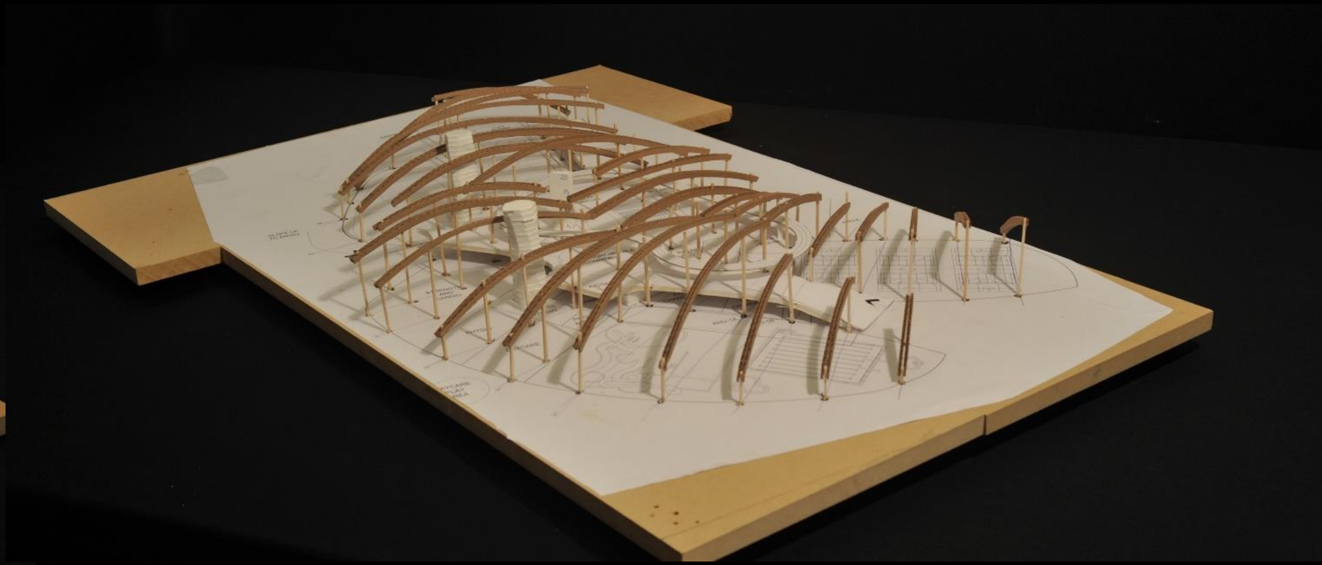


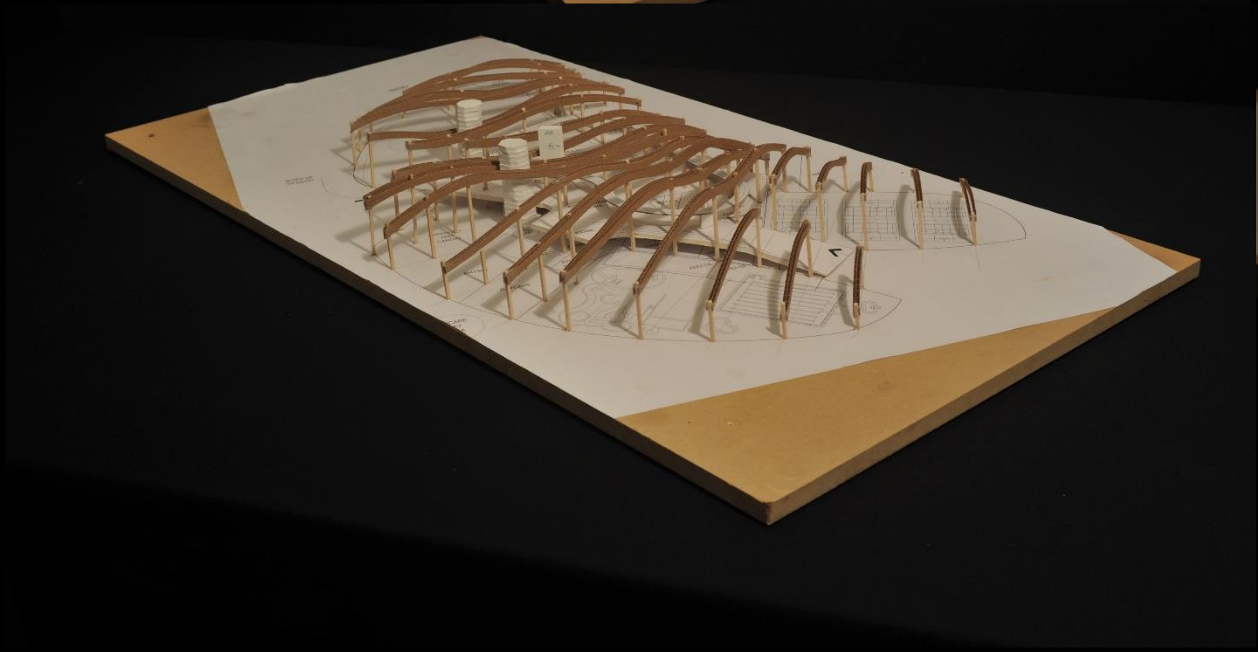


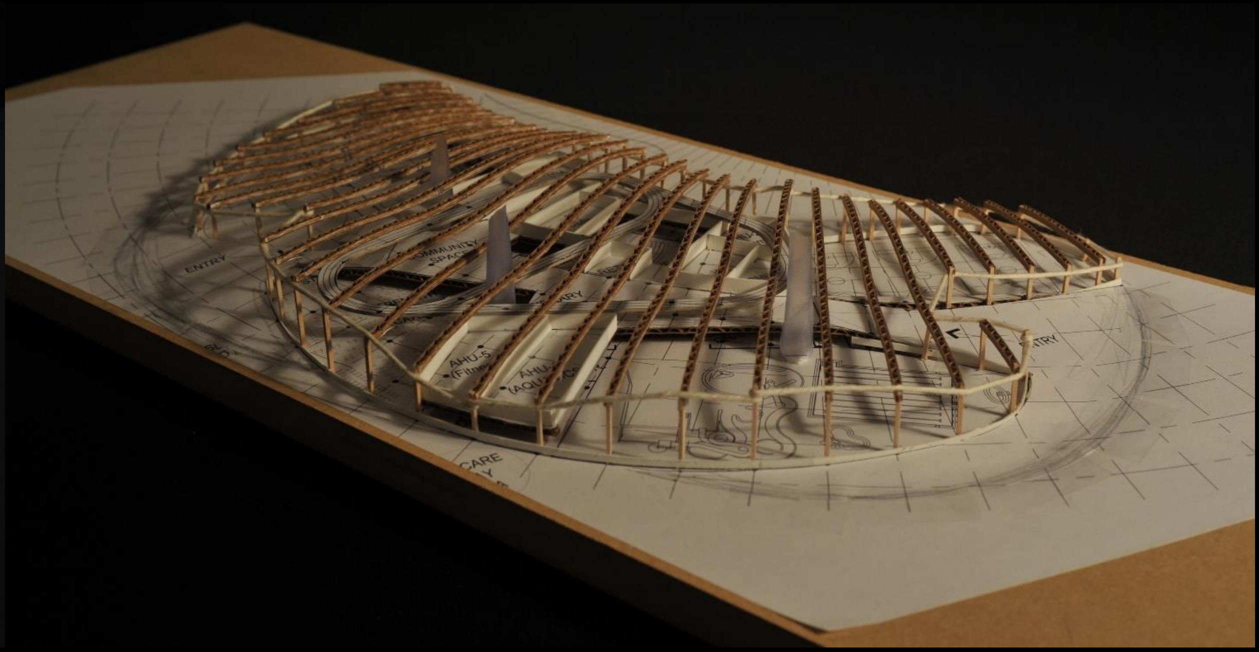




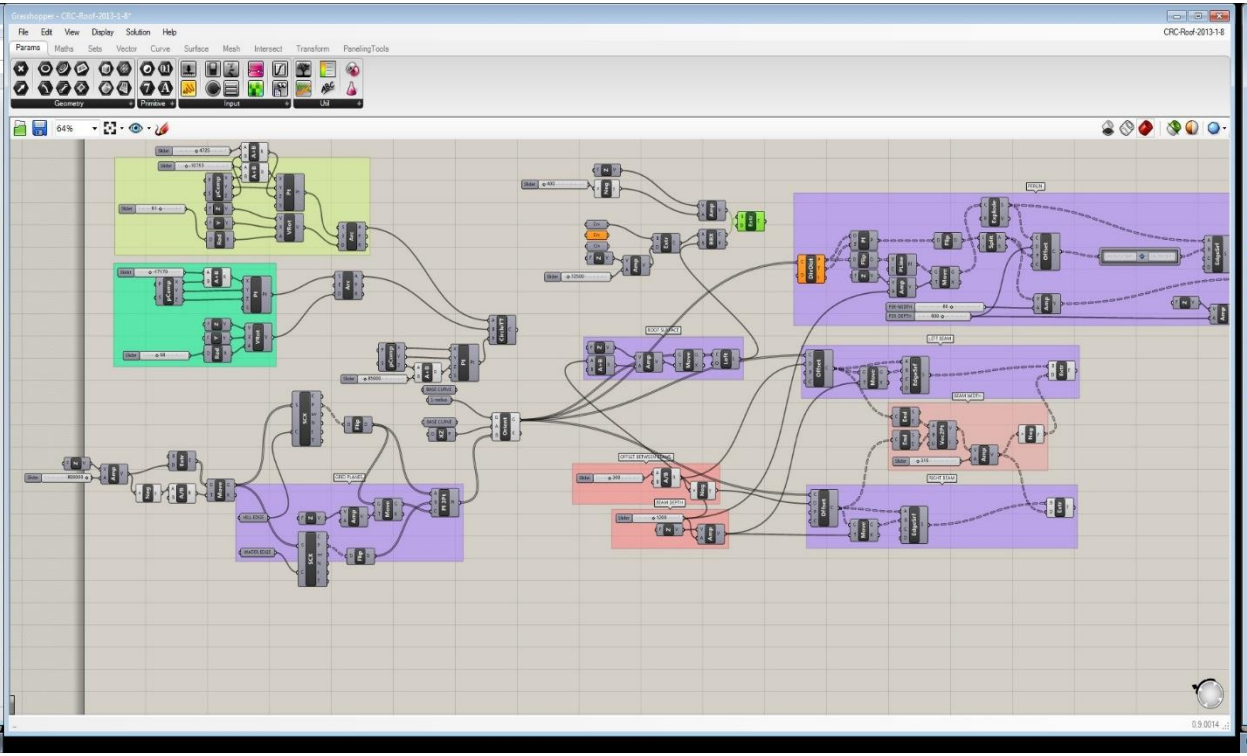


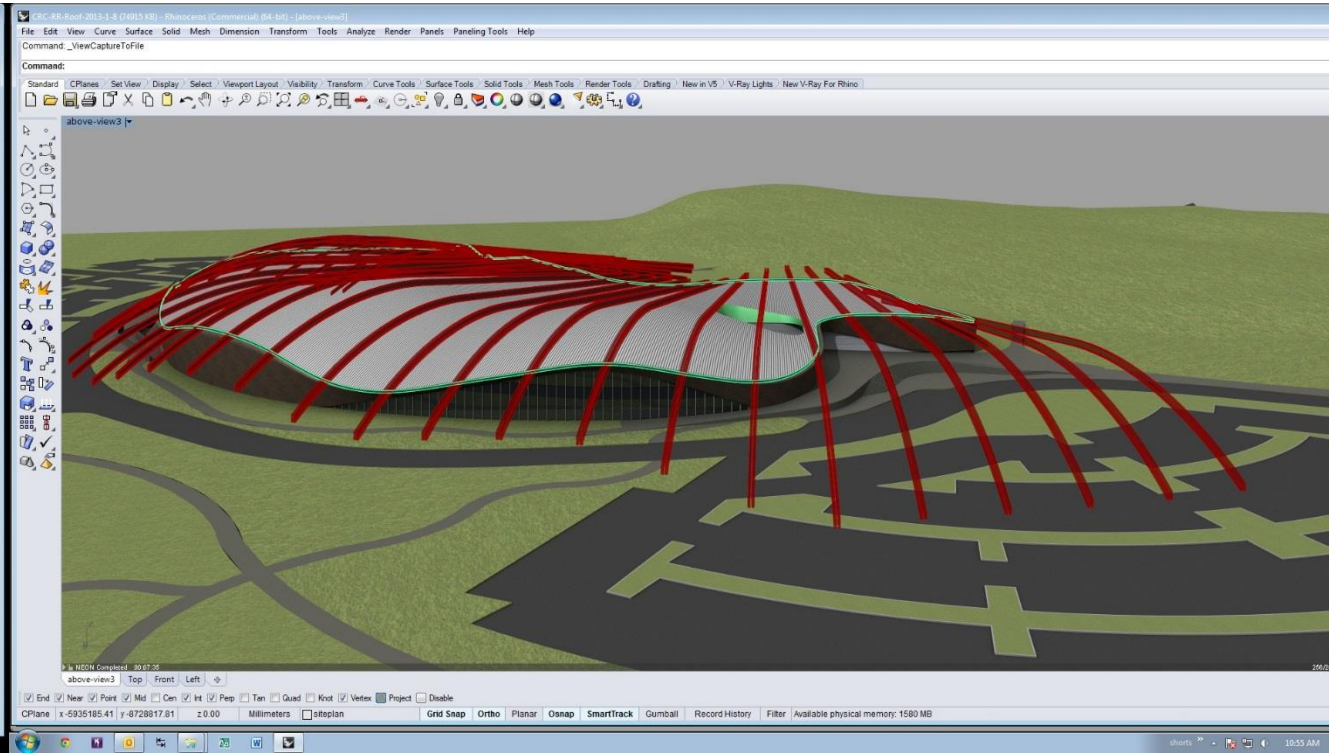


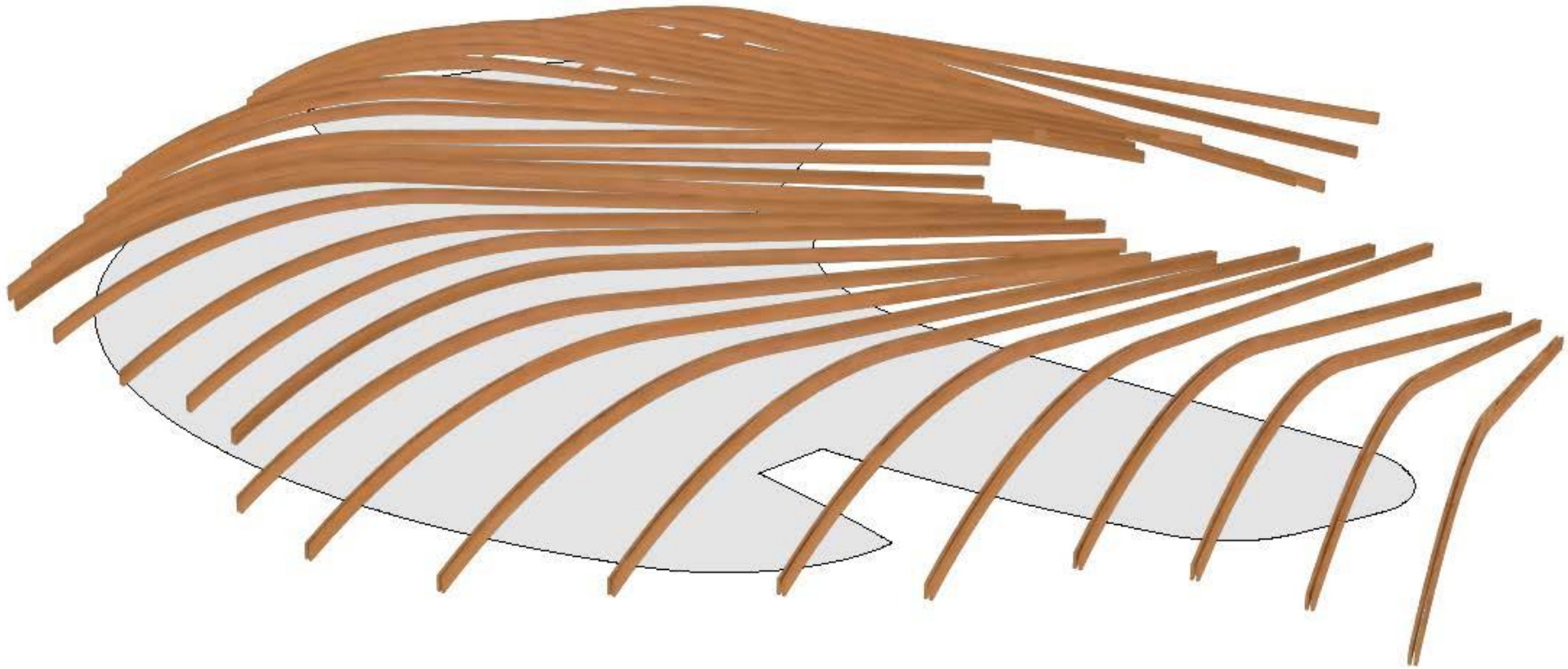


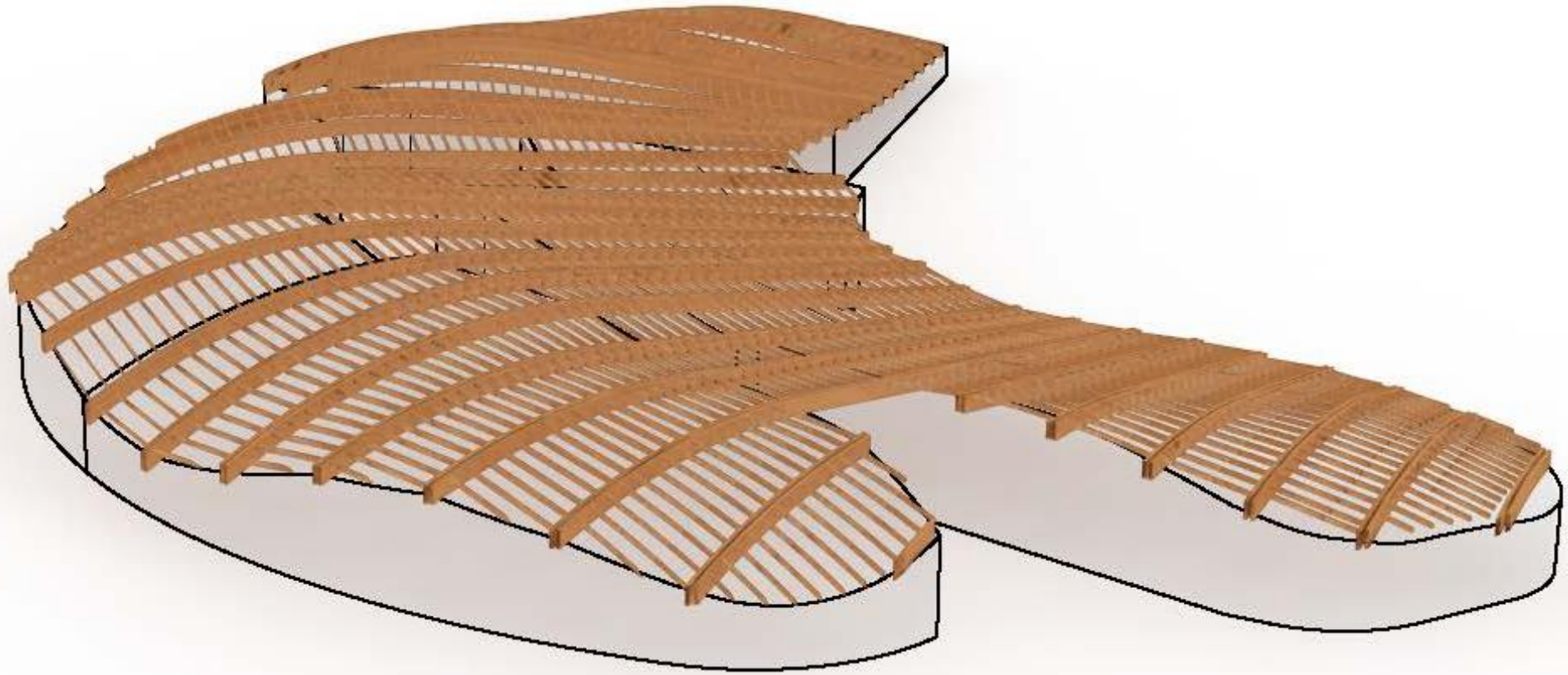


GEOMETRY DEVELOPMENT

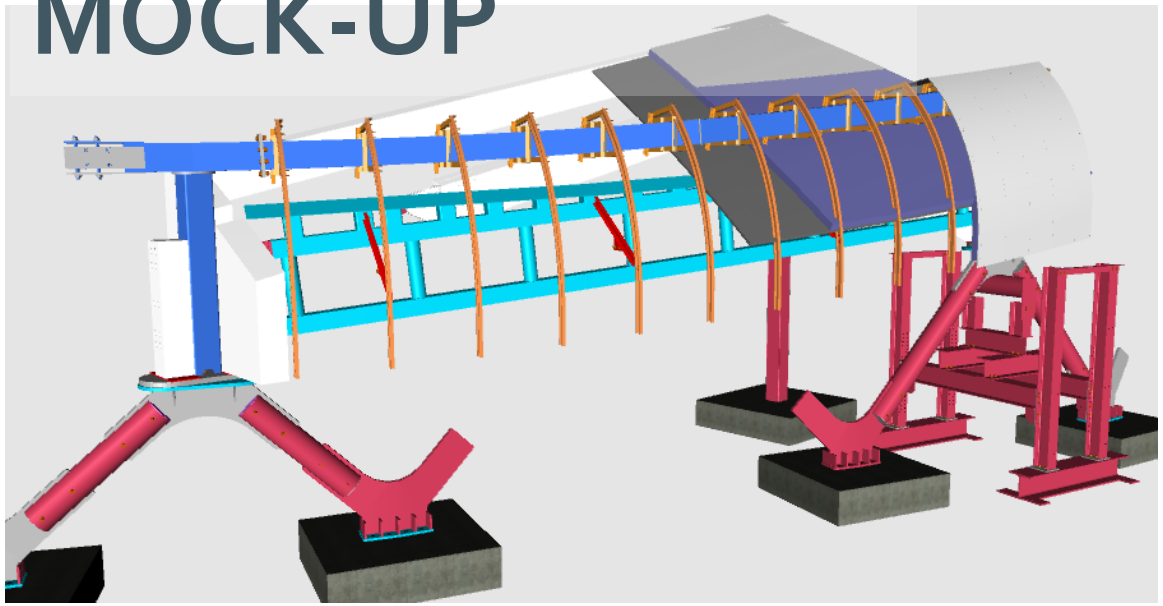


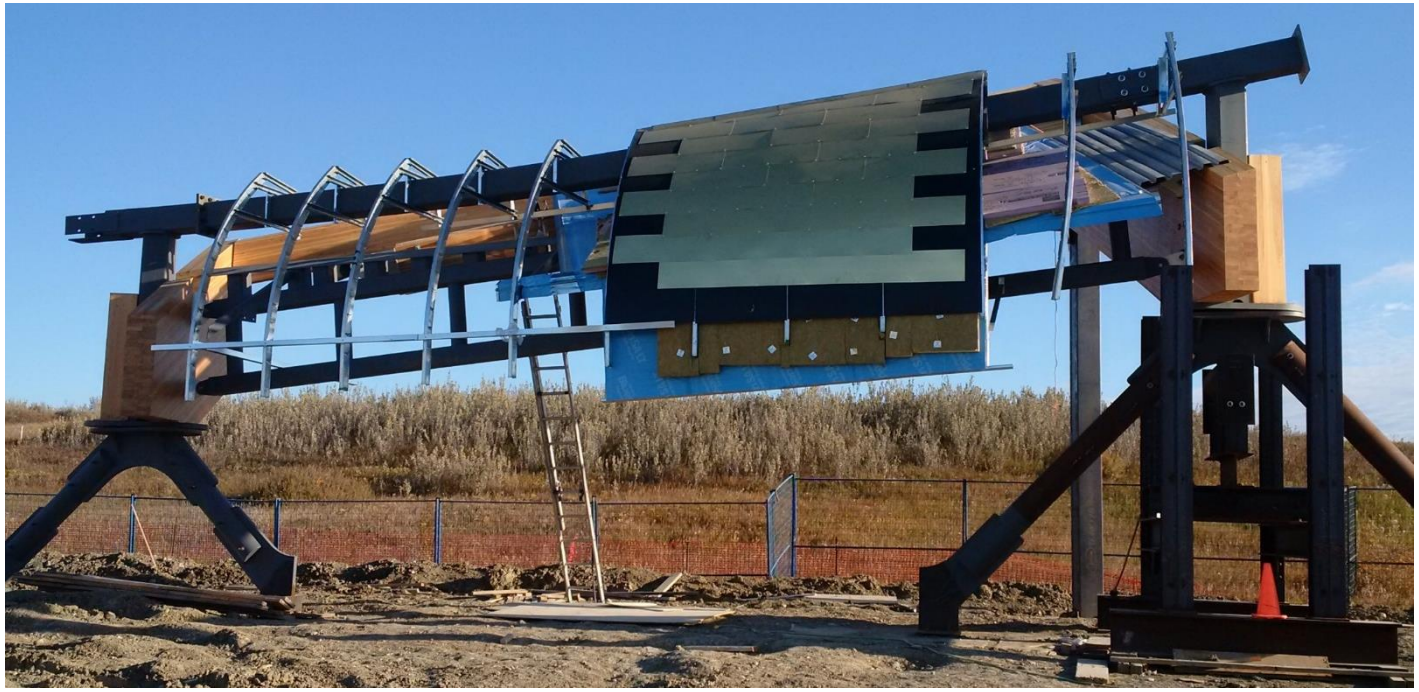


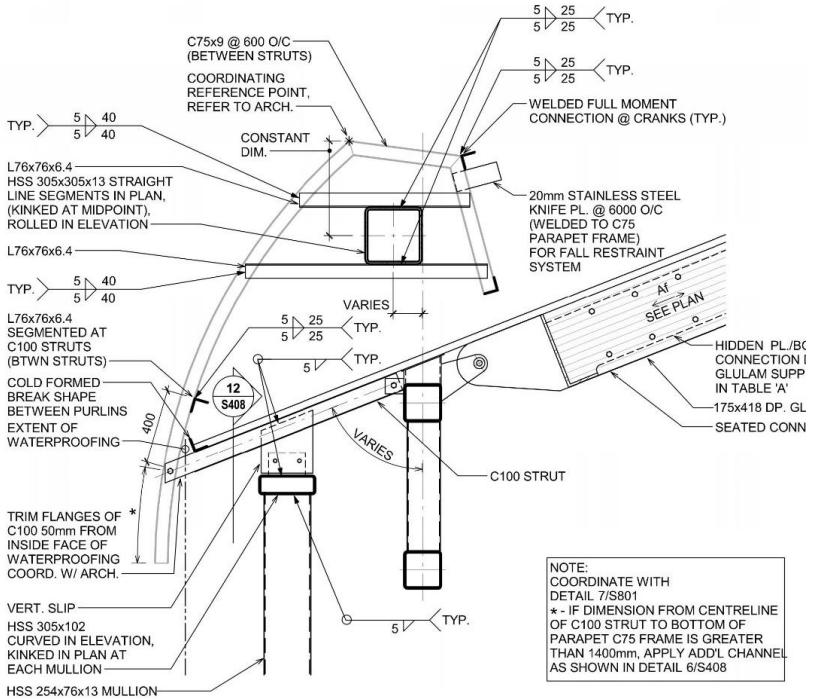




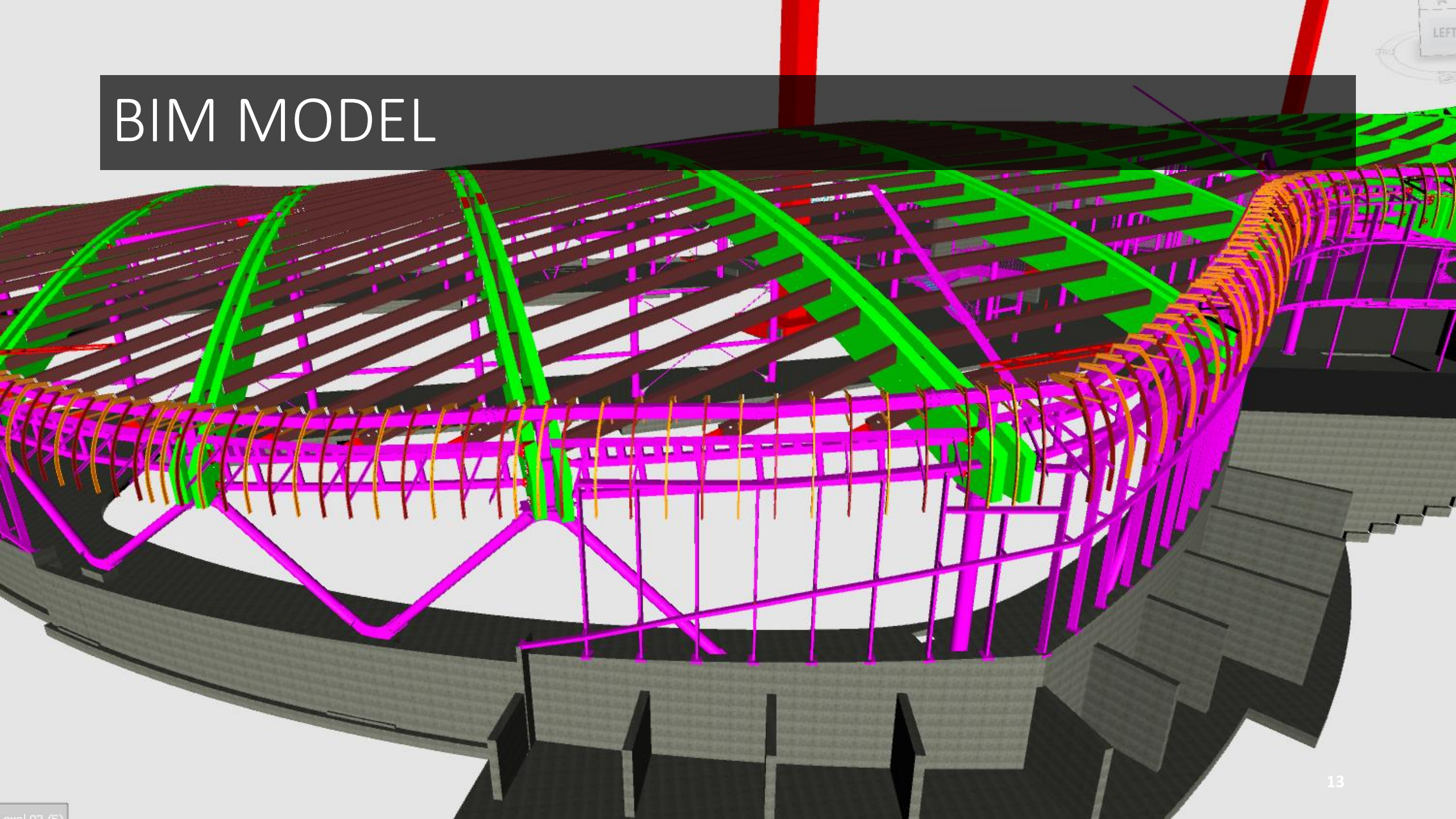
MOCK-UP






C75x9 @ 600 O/C
(BETWEEN STRUTS)
COORDINATING
REFERENCE POINT,
REFER TO ARCH.
WELDED FULL MOMENT
CONNECTION @ CRANKS (TYP.)
CONSTANT
DIM.
L76x76x6.4
HSS 305x305x13 STRAIGHT
LINE SEGMENTS IN PLAN,
(KINKED AT MIDPOINT),
ROLLED IN ELEVATION
L76x76x6.4
20mm STAINLESS STEEL
KNIFE PL. @ 6000 O/C
(WELDED TO C75
PARAPET FRAME)
FOR FALL RESTRAINT
SYSTEM
VARIES
L76x76x6.4
SEGMENTED AT
C100 STRUTS
(BTWN STRUTS)
COLD FORMED
BREAK SHAPE
BETWEEN PURLINS
EXTENT OF
WATERPROOFING
400
VARIES
C100 STRUT
TRIM FLANGES OF *
C100 50mm FROM
INSIDE FACE OF
WATERPROOFING
COORD. W/ ARCH.
VERT. SLIP
HSS 305x102
CURVED IN ELEVATION,
KINKED IN PLAN AT
EACH MULLION
HSS 254x76x13 MULLION
SEE PLAN
SEATED CONN
TYP.
NOTE:
COORDINATE WITH
DETAIL 7/S801
* - IF DIMENSION FROM CENTRELINE
OF C100 STRUT TO BOTTOM OF
PARAPET C75 FRAME IS GREATER
THAN 1400mm, APPLY ADD'L CHANNEL
AS SHOWN IN DETAIL 6/S408

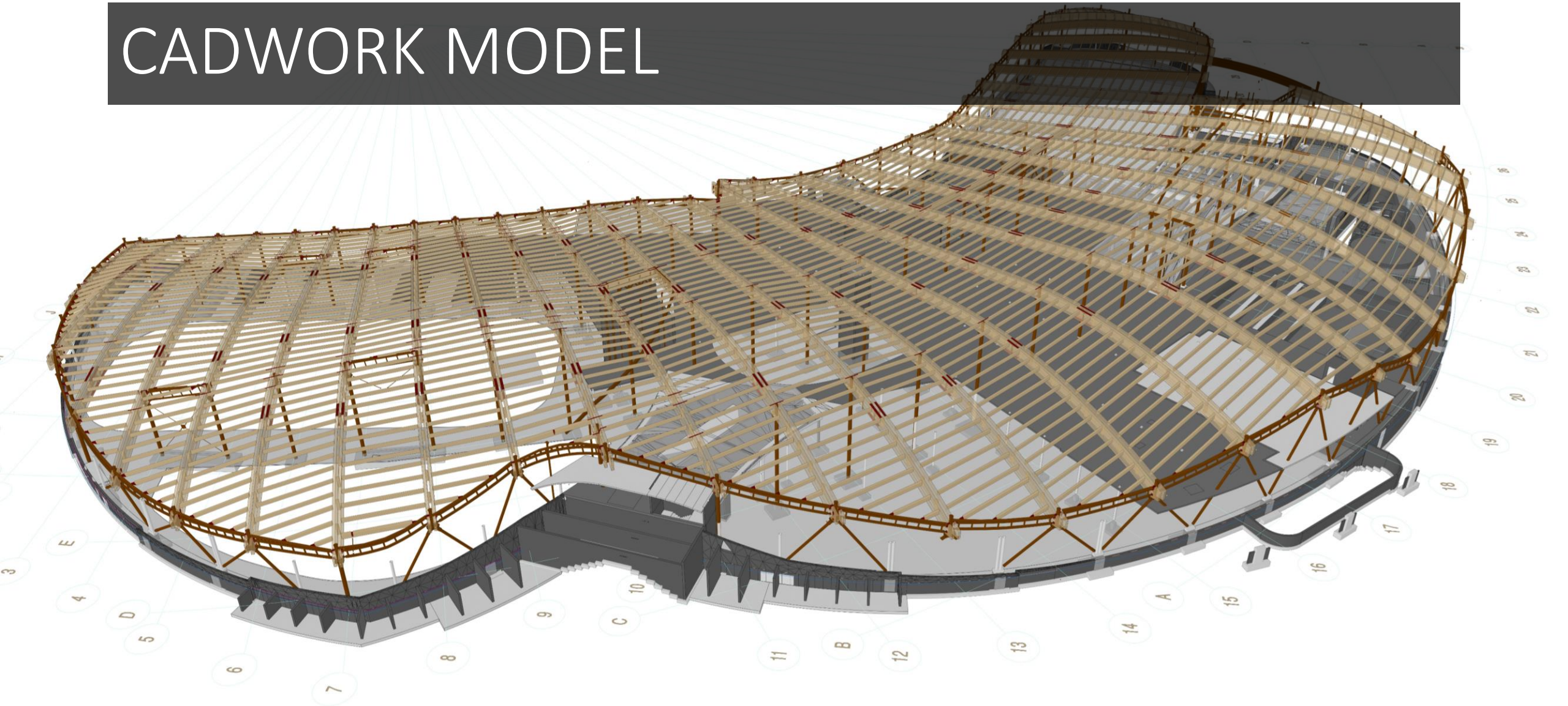
BIM MODEL



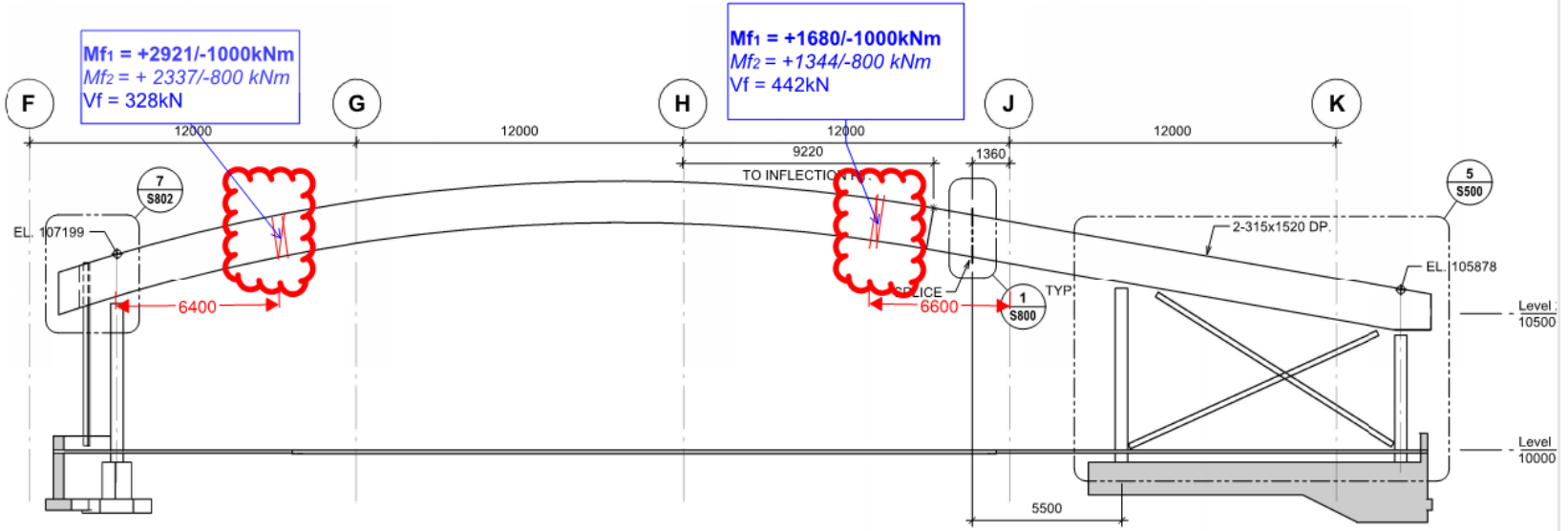
BIM MODEL

- Total station integration
- Steel concrete and glazing issues resolved or adjusted for as required
- No printed plans, digital sets and screens used most updated by all trades

CADWORK MODEL



MOMENT SPLICE



3 S400 **GRID 3 - ROOF BEAM ELEVATION**
1 : 150

RJC comments in BLUE

Mf1 : Factored Moment at proposed Splice Location - Load Case 1
Mf2 : Factored Moment at proposed Splice Location - Load Case 2

Vf : Factored Shear at proposed Splice Location
Af : Factored Axial Load (Shown on Plan)

VALUES GIVEN ARE FACTORED TOTAL, FOR THE 2 PAIRED BEAMS.

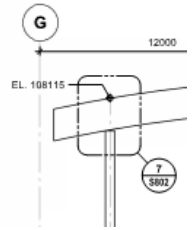
+VE MOMENT CORRESPONDS TO A TENSION FORCE ON THE BOTTOM FACE OF THE BEAM

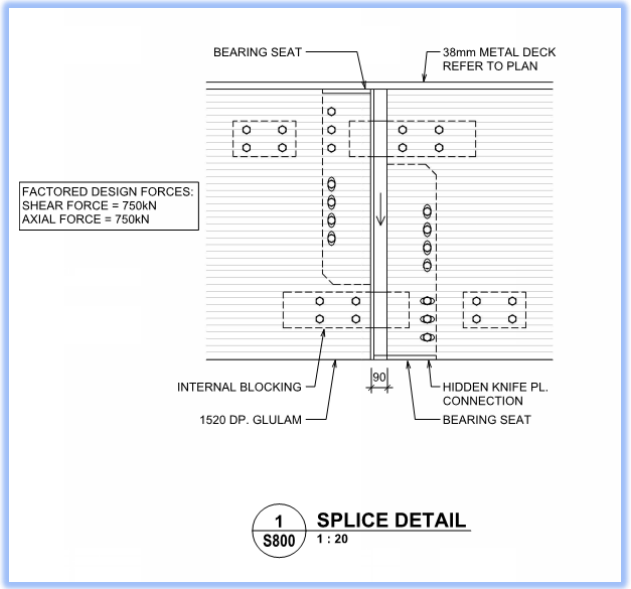
-VE MOMENT CORRESPONDS TO A TENSION FORCE ON THE TOP FACE OF THE BEAM

SPLICE DETAILS SHOULD BE DESIGNED FOR A MINIMUM TOTAL FACTORED MOMENT OF +/-1000kNm or greater (Load Case 1), +/-800kNm or greater (Load Case 2), AND A MINIMUM TOTAL FACTORED SHEAR VALUE OF 200kN (CORRESPONDING TO 18% OF BEAM CAPACITY)

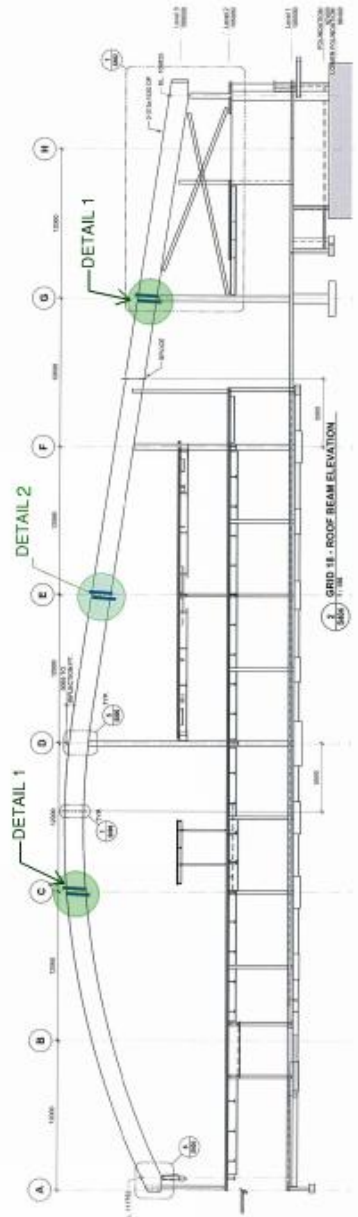
Load Case 1 : to full factored loading with no consideration of axial load

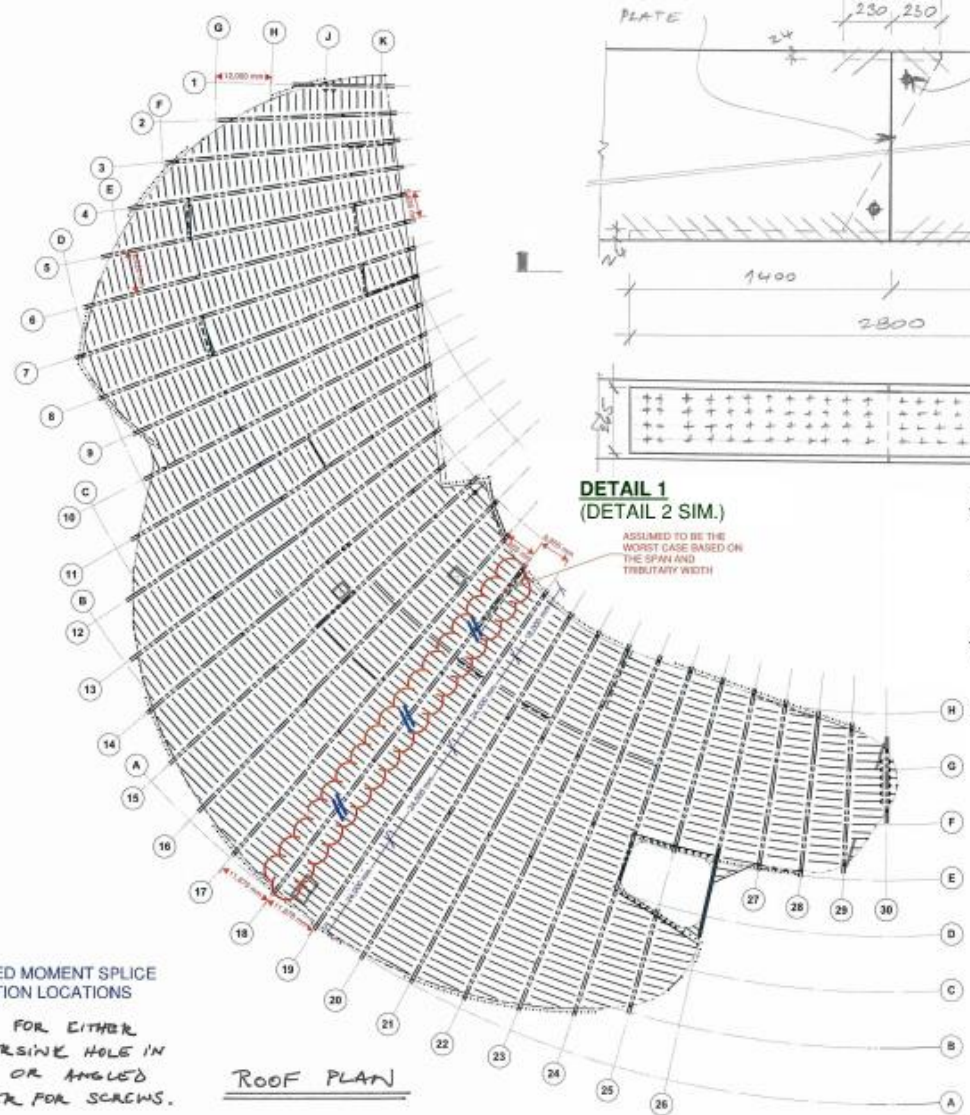
Load Case 2 : alternative factored load case, in which Axial Force is present. For Factored axial loads, see plan





1 S800 **SPLICE DETAIL**
1 : 20

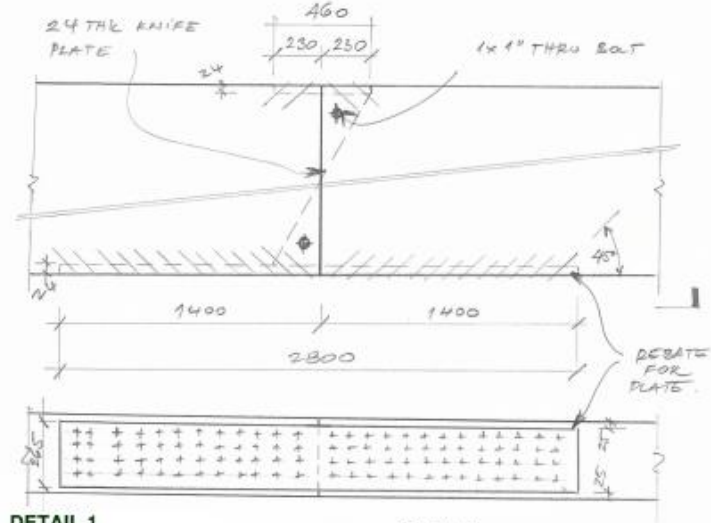




// - PROPOSED MOMENT SPLICE CONNECTION LOCATIONS

+ - ALLOW FOR EITHER COUNTERSINK HOLE IN PLATE OR ANGLED WASHER FOR SCREWS.

ROOF PLAN



DETAIL 1
(DETAIL 2 SIM.)

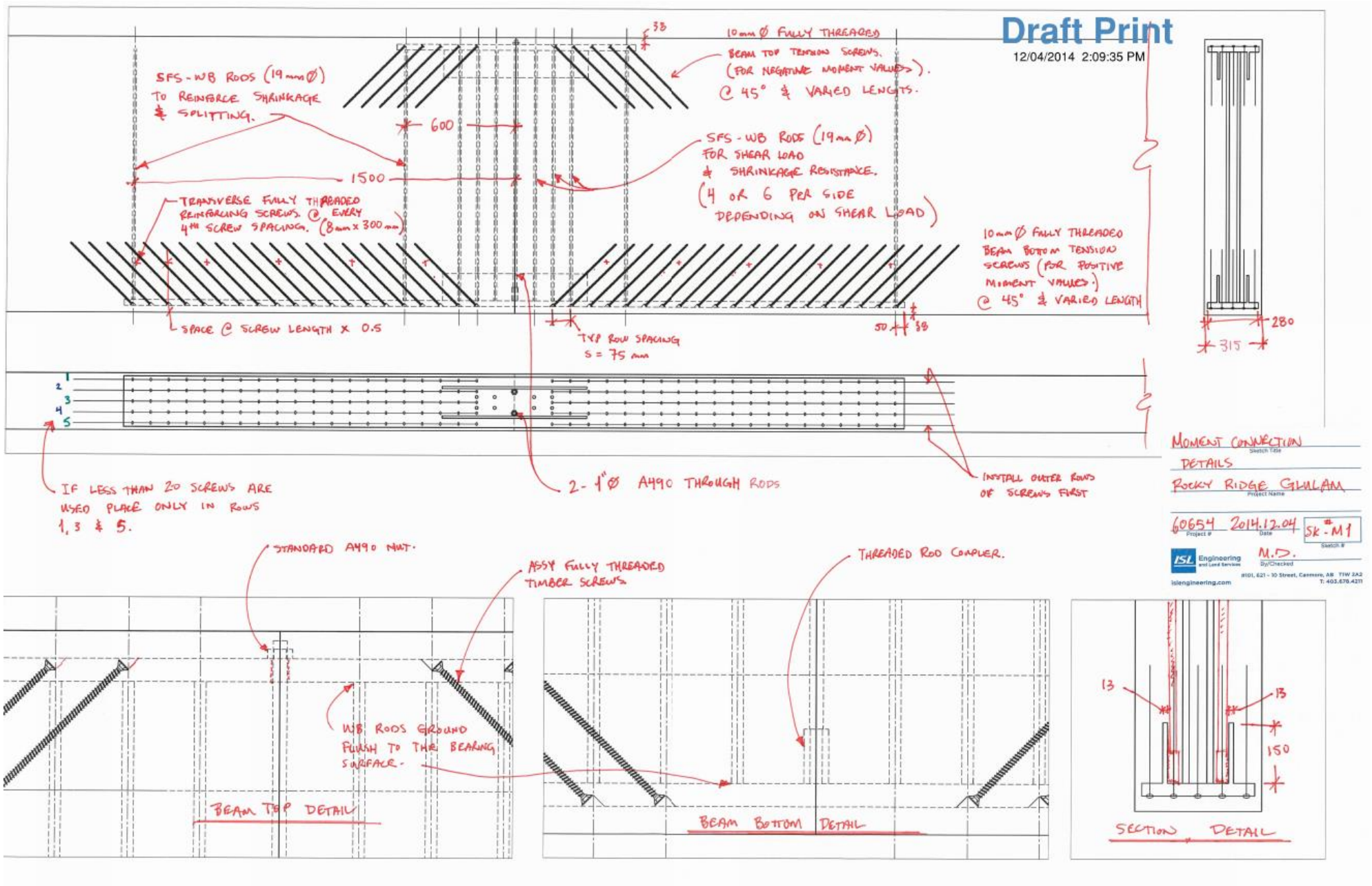
ASSUMED TO BE THE WORST CASE BASED ON THE SPAN AND TRIBUTARY WIDTH

DETAIL 1:
TOP : 460x265X24thk SPLICE PLATE
8x ASSY VG CS 12dia SCREWS
235mm PENETRATION
BTM : 2800x265X24thk SPLICE PLATE
120x ASSY VG CS 12dia SCREWS
235mm PENETRATION

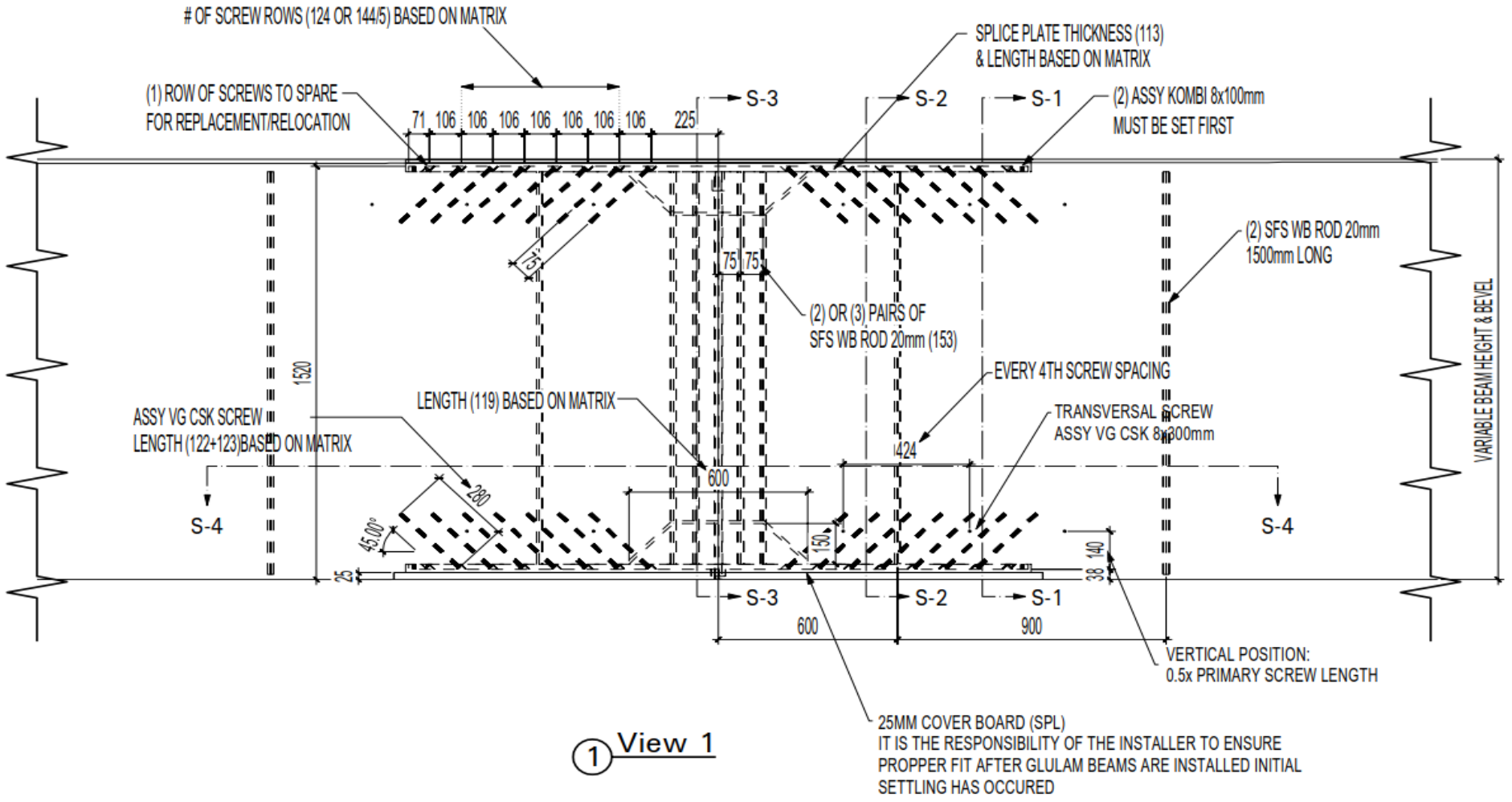
DETAIL 2:
TOP : 460x265X24thk SPLICE PLATE
8x ASSY VG CS 12dia SCREWS
235mm PENETRATION
BTM : 1720x265X24thk SPLICE PLATE
66x ASSY VG CS 12dia SCREWS
235mm PENETRATION

PROPOSED MOMENT SPLICE CONNECTION (C.S. GLULAM CONNECTIONS
Sketch Title
ROCKY RIDGE REC.
Project Name
3'D
Project #
2019 06 18
Date
SK-01(r1)
Sketch #
ISL Engineering and Land Services
JAN TOBER
By/Checked
islengineering.com
#103, 631 - 10 Street, Canmore, AB T1W 2A2
T: 403.678.4211

ROCKY RIDGE RECREATION FACILITY
ROOF COMPOSITE PLAN
5255
5240

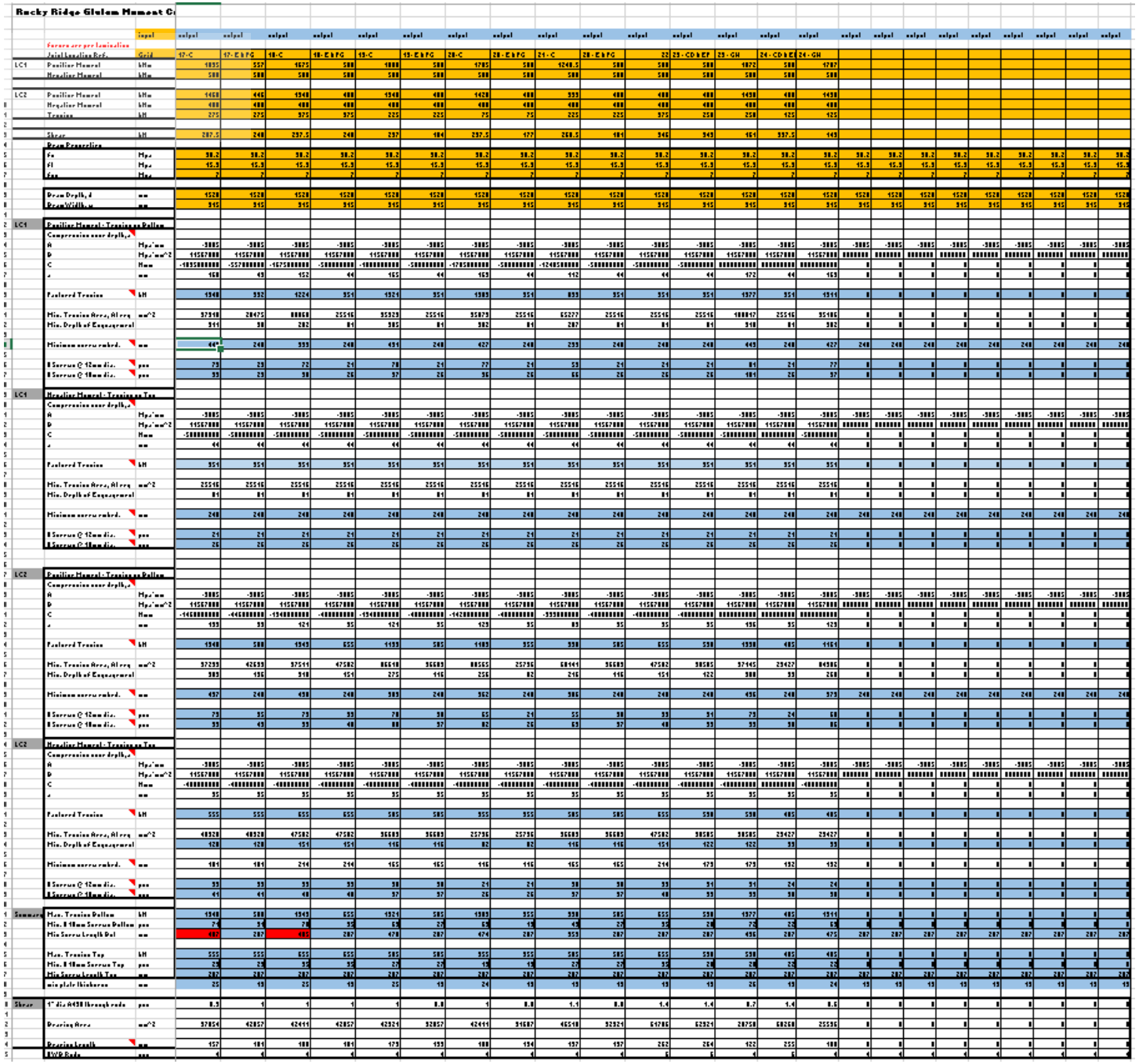

Draft Print
12/04/2014 2:09:35 PM
38
10mm Ø FULLY THREADED BEAM TOP TENSION SCREWS. (FOR NEGATIVE MOMENT VALUES). @ 45° & VARIED LENGTHS.
SFS-WB RODS (19mm Ø) TO REINFORCE SHRINKAGE & SPLITTING.
600
1500
SFS-WB RODS (19mm Ø) FOR SHEAR LOAD & SHRINKAGE RESISTANCE. (4 OR 6 PER SIDE DEPENDING ON SHEAR LOAD)
TRANSVERSE FULLY THREADED REINFORCING SCREWS @ EVERY 4TH SCREW SPACING. (8mm x 300mm)
SPACE @ SCREW LENGTH X 0.5
TYP ROW SPACING s = 75 mm
50
38
10mm Ø FULLY THREADED BEAM BOTTOM TENSION SCREWS (FOR POSITIVE MOMENT VALUES) @ 45° & VARIED LENGTH
280
315
1
2
3
4
5
IF LESS THAN 20 SCREWS ARE USED PLACE ONLY IN ROWS 1, 3 & 5.
2-1"Ø A490 THROUGH RODS
INSTALL OUTER ROWS OF SCREWS FIRST
MOMENT CONNECTION DETAILS
ROCKY RIDGE GUILAM
60654 2014.12.04 SK-M1
M.D.
ISL Engineering and Land Services
#101, 621 - 10 Street, Canmore, AB T1W 2A2
T: 403.678.4211
islengineering.com
STANDARD A490 NUT.
ASSY FULLY THREADED TIMBER SCREWS
THREADED ROD COUPLER.
WB RODS GROUND FLUSH TO THE BEARING SURFACE.
BEAM TOP DETAIL
BEAM BOTTOM DETAIL
13
13
150
SECTION DETAIL

FINAL DESIGN

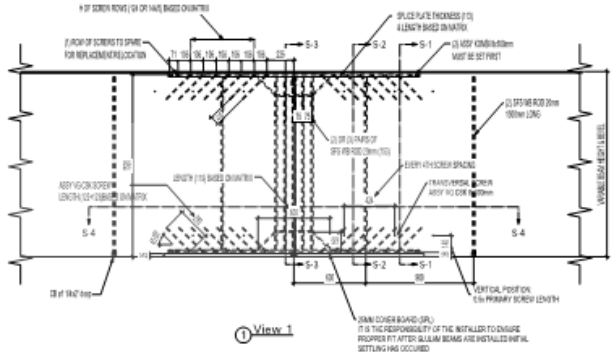


1 View 1

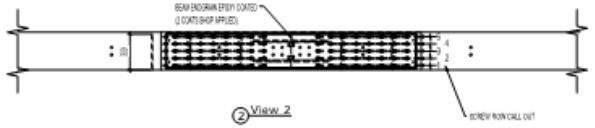
CALCULATION MATRIX



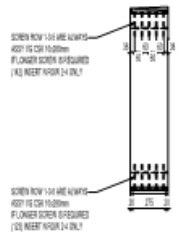
FABRICATION MATRIX



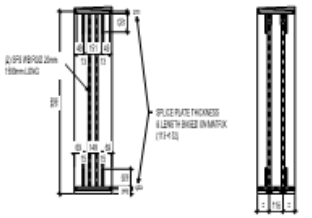
1 View 1



2 View 2



3 Section 1



4 Section 2

5 Section 3

6 Section 4

SPLICE INSTALLATION PROCEDURE

INSTALL SFS WB RODS USING SETTING TOOL (AVAILABLE THROUGH SFS INTEC
RODS MUST BE FLUSH TO DAP SURFACE
ATTACH 2 THREADED ROD x 59" TO SPLICE PLATE
ATTACH SPLICE PLATE TOP OR BOTTOM INTO DAP OF MAIN BEAM;
"SPLICE JOINTS MUST BE TIGHTLY BUTTED TOGETHER
WITH FULL BEARING TO EACH OTHER."
USE 2- ASSY KOMBI 8x100 ALIGN SPLICE @ CENTER JOINT
INSTALL ASSY VG 8x300 TRANSVERSAL SCREWS
INSTALL ASSY VG CSK SCREWS INTO ANGLED CSink HOLES USING CERTIFIED TORQUE WRENCH
(CONSULT SCREW MANUFACTURER FOR TORQUE SETTING) MAXIMUM 36NM
INSTALL ROW 1&5 FIRST ALTERNATING BTW. 1&5
INSTALL ORDER FOR REMAING ROWS 2-4-3
NOTE: 5 EXTRA HOLES PROVIDED IF SCREWS BREAK
OR REQUIRE RELOCATION DUE TO CONFLICT WITH OTHER FASTENERS
DO NOT FILL ALL PROVIDED HOLES IF NOT REQUIRED OR SCHEDULED SCREWS BREAK
ADDITIONAL RELOCATION INSTRUCTION TO FOLLOW WITH IFC DRAWING RELEASE

INSTALL 2nd SPLICE PLATE WITH IDENTICAL PROCEDURE AS OUTLINED ABOVE

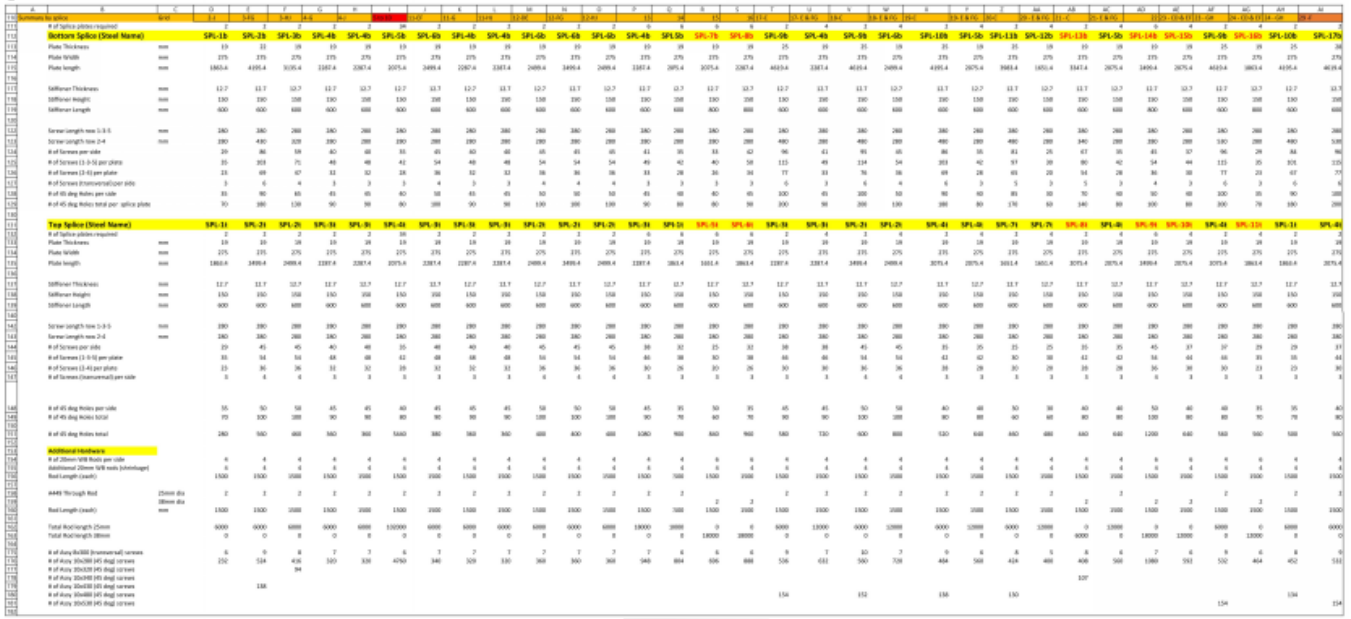
SPLICE BEAMS AND LINE UP END GRAIN EXACT
IF REQUIRED LIFT INSTALLED BEAM TO AID ALLIGNMENT

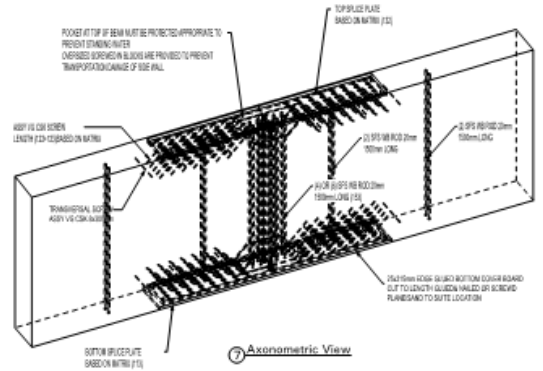
TIGHTEN BEAM JOINTS USING WINCH (COME ALONG) OR SIMILAR TOOL
INSTALL REMAINING SCREWS WITH SAME EXACT PROCEDURE AS OUTLINED ABOVE

ATTACH AND TIGHTEN THE NUTS ON THE TREADED RODS

INSTALL BOTTOM COVER BOARD USING GLUE AND FINISHING NAILS

Area A: Grid 1-8
Area B: Grid 9-14
Area C Grid 15-20
Area D Grid 21-25
Area E: Grid 26-30





7 Axonometric View

PERMIT TO PRACTICE
ISL Engineering and Land Services Ltd.
Signature
Date
PERMIT NUMBER: P 07410
The Association of Professional Engineers and Geoscientists of Alberta

NO.	DATE	REVISION	BY	CH
3	07-07-2015	Revision based on Mark ups	ME	
2	03-06-2015	Revision based on Mark ups	ME	
1	20-05-2015	General revision / addition	ME	
5	10-10-2015	Tension Strap and Purlin Connector	ME	
4	10-09-2015	Revision based on Mark ups	ME	

ISSUED FOR CONSTRUCTION
Date: 29. FEB. 2016

STRUCTURLAM PRODUCTS LP.
179 Government St.
Penticton, B.C. V2A 4R9
PH: 250-492-0915
FAX:250-492-0995
Website: www.structurlam.com

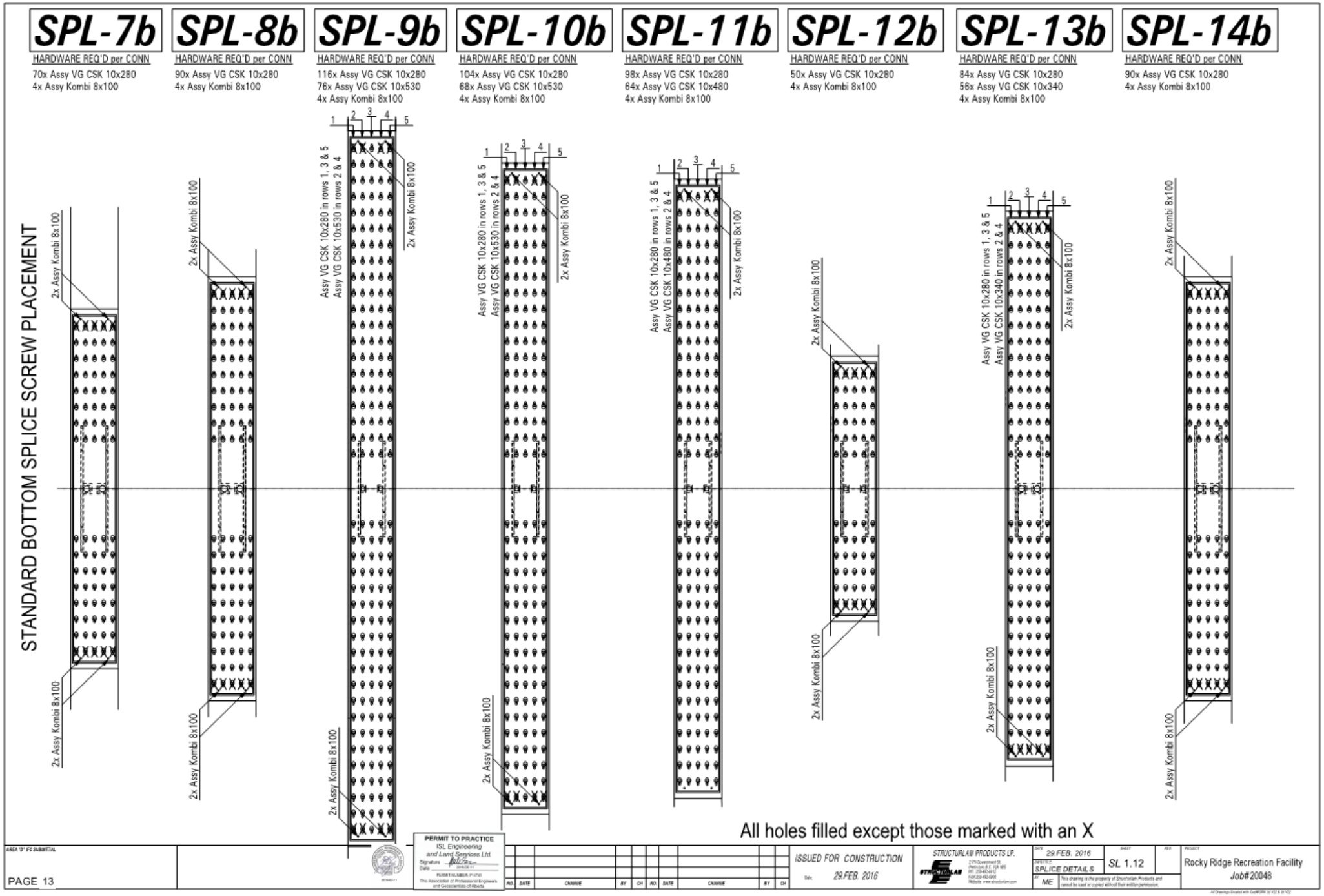
DATE	SHEET	REV
29. FEB. 2016	SL 1.7	5

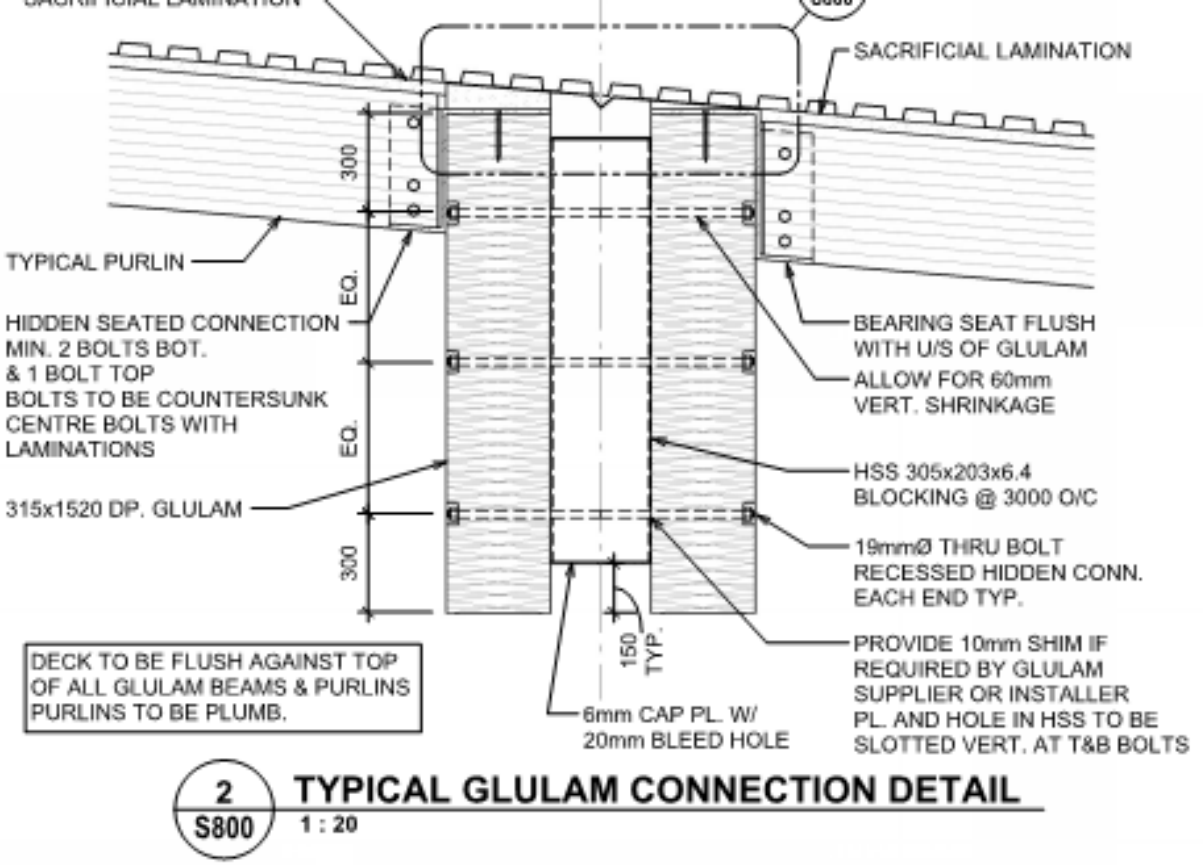
DRAWING: GENERIC DETAILS
BY: ME

This drawing is the property of Structurlam Products and cannot be used or copied without their written permission.

PROJECT: Rocky Ridge Recreation Facility
Job# 20048

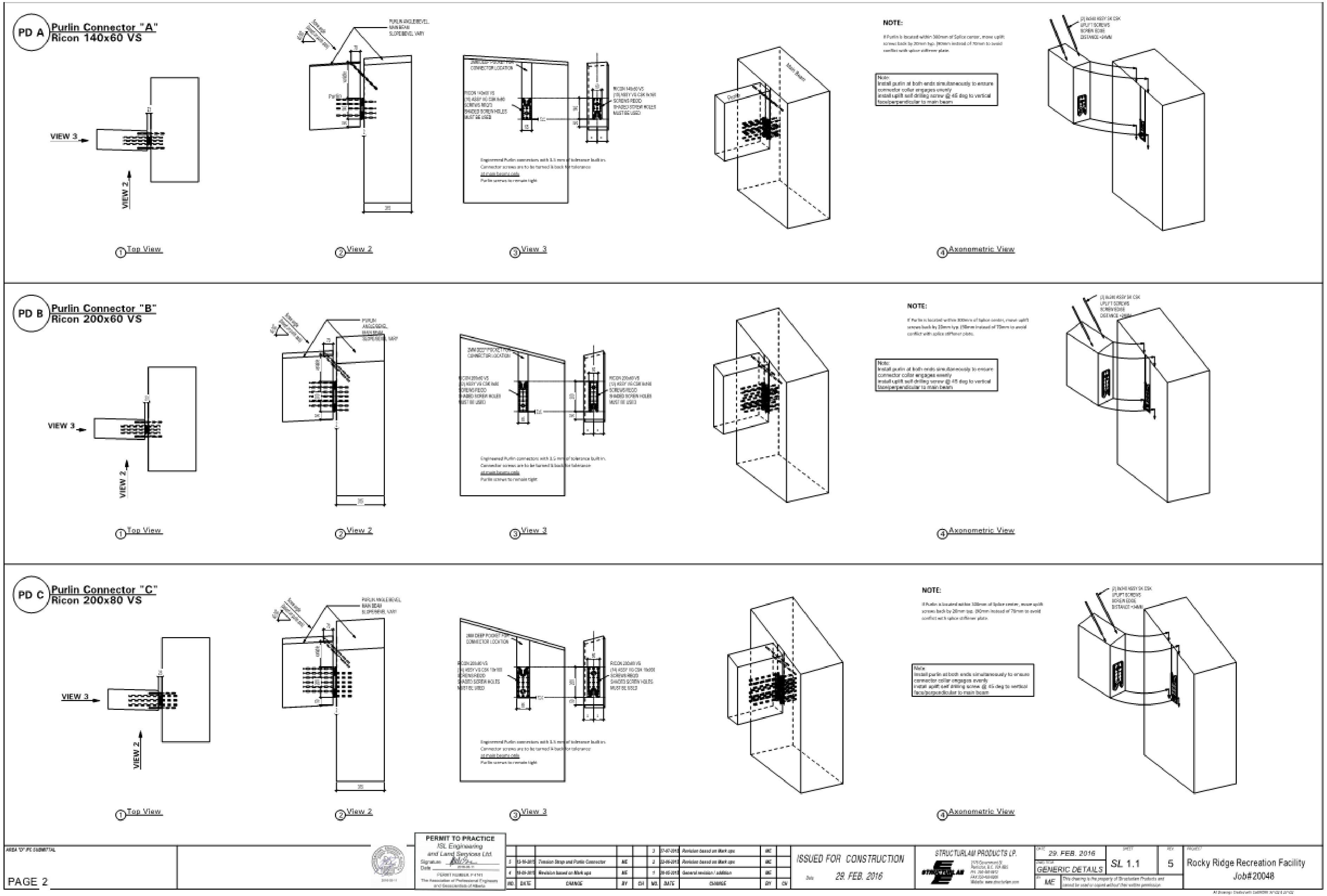
AREA "D" IFC SUBMITTAL


SPL-7b
HARDWARE REQ'D per CONN
70x Assy VG CSK 10x280
4x Assy Kombi 8x100
SPL-8b
HARDWARE REQ'D per CONN
90x Assy VG CSK 10x280
4x Assy Kombi 8x100
SPL-9b
HARDWARE REQ'D per CONN
116x Assy VG CSK 10x280
76x Assy VG CSK 10x530
4x Assy Kombi 8x100
SPL-10b
HARDWARE REQ'D per CONN
104x Assy VG CSK 10x280
68x Assy VG CSK 10x530
4x Assy Kombi 8x100
SPL-11b
HARDWARE REQ'D per CONN
98x Assy VG CSK 10x280
64x Assy VG CSK 10x480
4x Assy Kombi 8x100
SPL-12b
HARDWARE REQ'D per CONN
50x Assy VG CSK 10x280
4x Assy Kombi 8x100
SPL-13b
HARDWARE REQ'D per CONN
84x Assy VG CSK 10x280
56x Assy VG CSK 10x340
4x Assy Kombi 8x100
SPL-14b
HARDWARE REQ'D per CONN
90x Assy VG CSK 10x280
4x Assy Kombi 8x100
STANDARD BOTTOM SPLICE SCREW PLACEMENT
2x Assy Kombi 8x100
Assy VG CSK 10x280 in rows 1, 3 & 5
Assy VG CSK 10x530 in rows 2 & 4
Assy VG CSK 10x480 in rows 2 & 4
Assy VG CSK 10x340 in rows 2 & 4
All holes filled except those marked with an X
PERMIT TO PRACTICE
ISL Engineering and Land Services Ltd.
ISSUED FOR CONSTRUCTION
29.FEB. 2016
STRUCTURLAM PRODUCTS LP.
SPLICE DETAILS
SL 1.12
Rocky Ridge Recreation Facility
Job#20048
PAGE 13

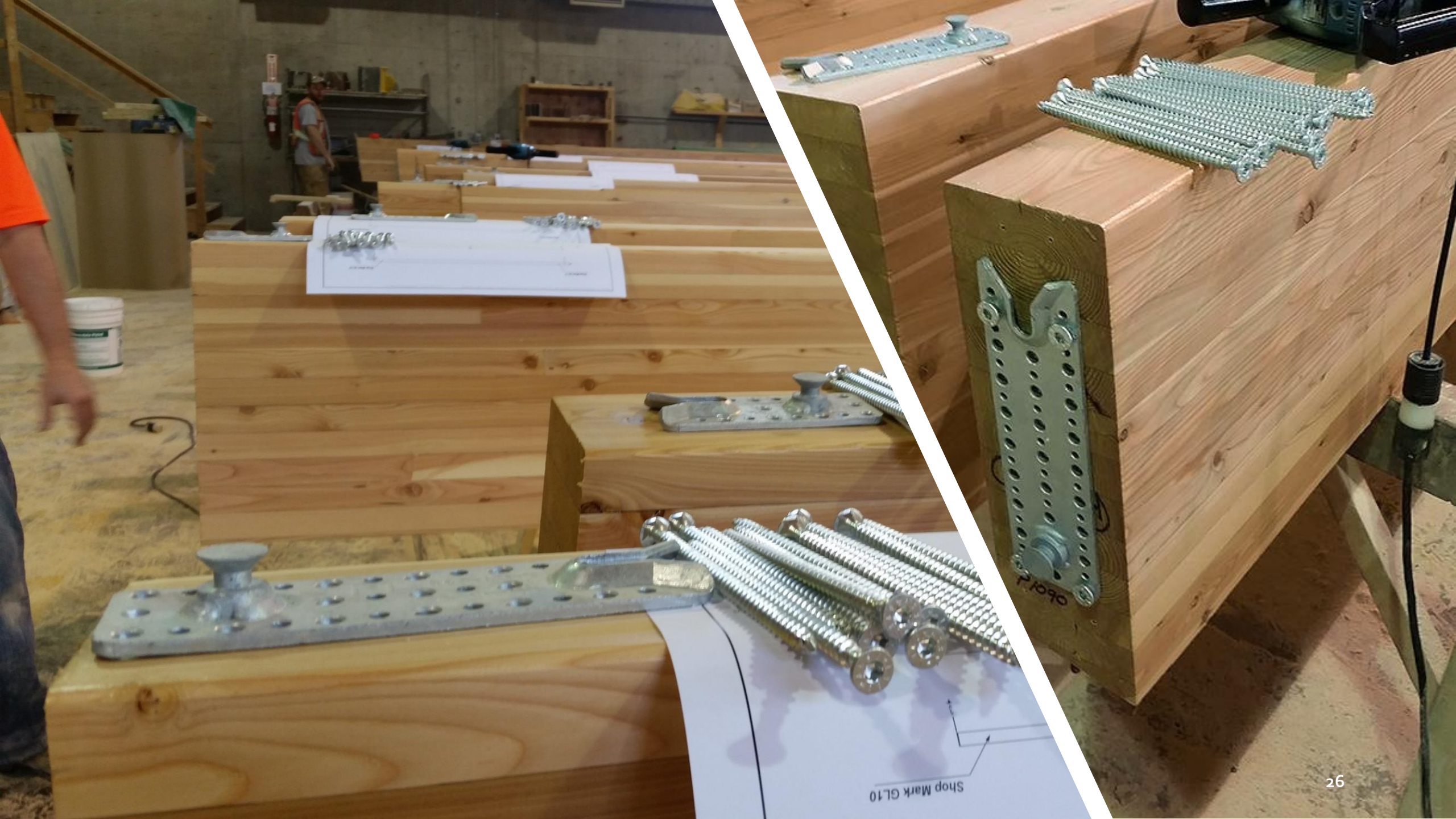


PURLIN CONNECTIONS

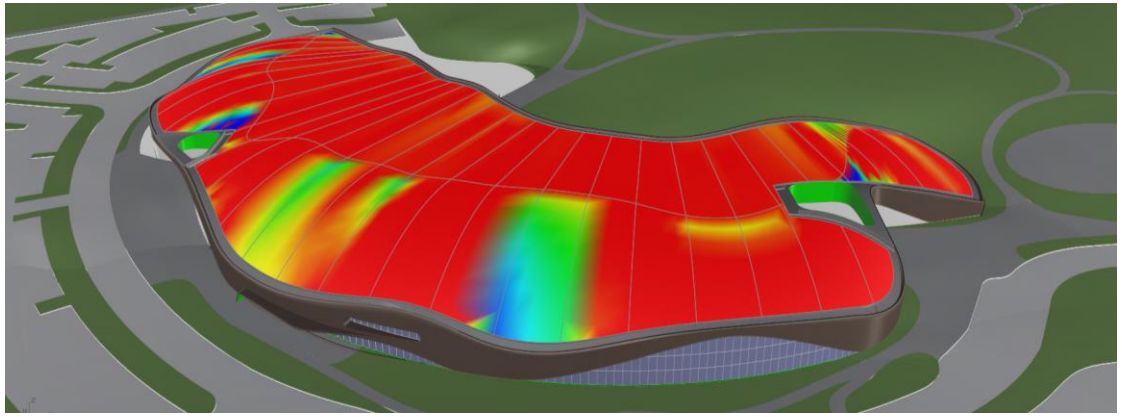

TYPICAL 2
(NO AXIAL LOADS)
Header
Joist
Connector
Collar bolt
Screws
Joist
Header
140/60
VS Welded
10 x ASSY VG CSK 8x160
10 x ASSY VG CSK 8x80
140/60 d12
EK M12
7 x ASSY VG CSK 8x160
7 x ASSY VG CSK 8x80
VS = RICON® S with welded collar bolt.
EK = RICON® S with retaining screw collar bolt
Minimum timber dimensions 100x160 mm
Number of screws can be reduced due to the load.
TYPICAL 1
(NO AXIAL LOADS)
Header
Joist
Connector
Collar bolt
Screws
Joist
Header
200/60
VS Welded
12 x ASSY VG CSK 8x160
12 x ASSY VG CSK 8x80
200/60 d12
EK M12
8 x ASSY VG CSK 8x160
8 x ASSY VG CSK 8x80
VS = RICON® S with welded collar bolt.
EK = RICON® S with retaining screw collar bolt
Minimum timber dimensions 100x220 mm
Number of screws can be reduced due to the load.
11,878 mm
TYP. BAY ELEVATION
FOR CONTINUATION SEE DRAWING S402
FOR CONTINUATION SEE DRAWING S304
PROPOSED TYPICAL
Sketch Title
PURLIN CONNECTIONS
ROCKY RIDGE REC.
Project Name
GLULAM CONNECTION
BID
Project #
20140618
Date
SK-02
Sketch #
IAN HOBER
By/Checked
ISL Engineering and Land Services
#101, 621 - 10 Street, Canmore, AB T1W 2A2
T: 403.678.421
islengineering.com

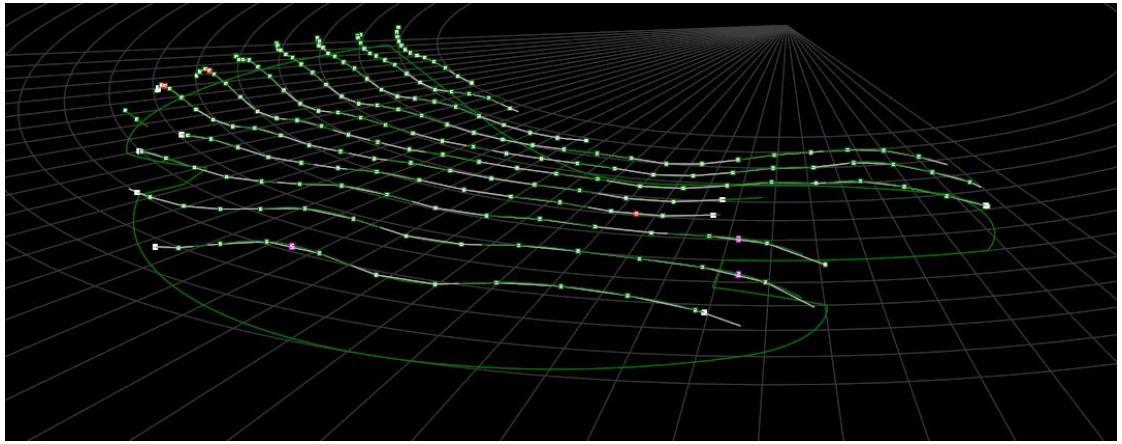


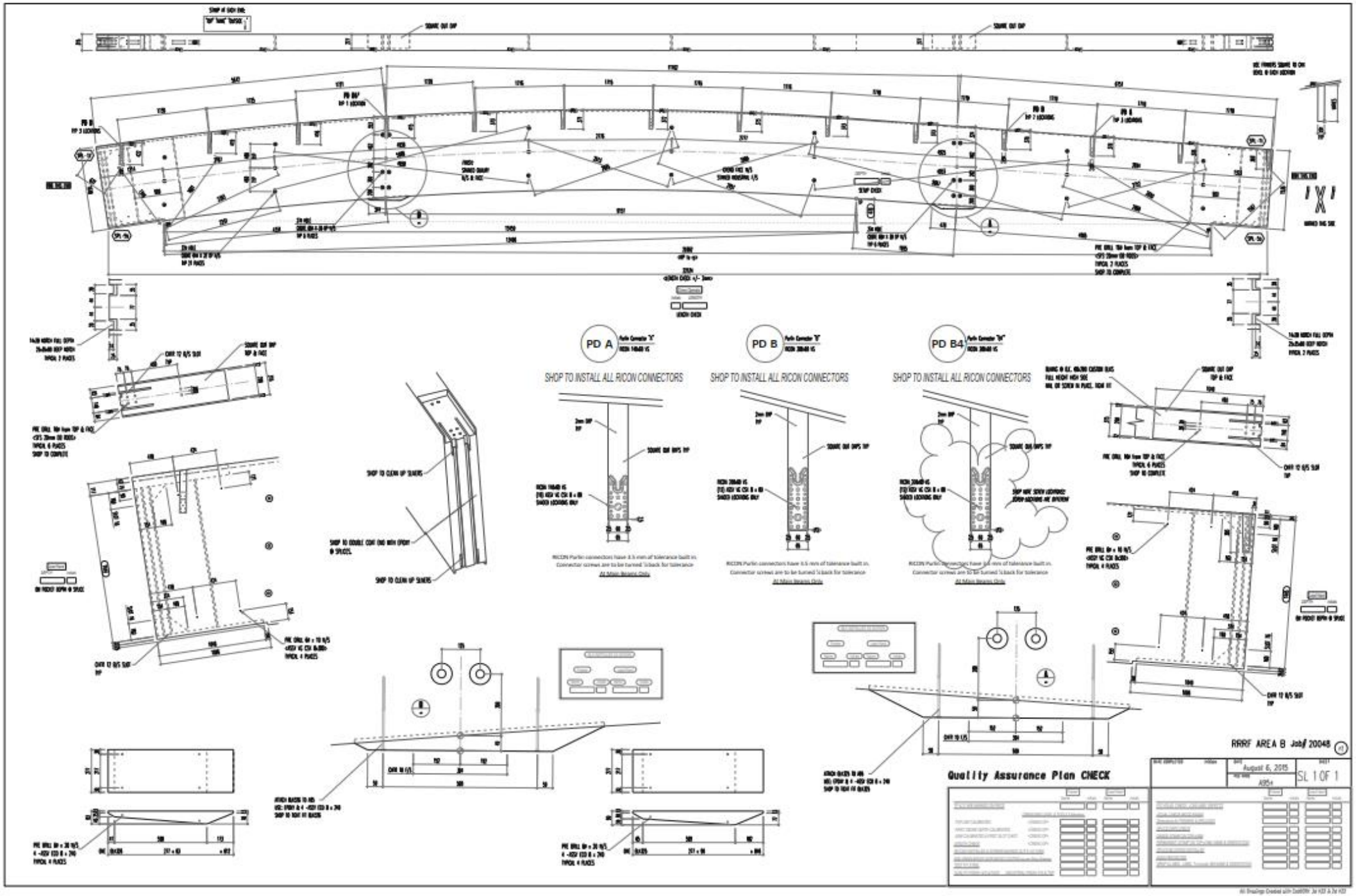
PD A
Purlin Connector "A"
Ricon 140x60 VS
VIEW 3
VIEW 2
Top View
View 2
View 3
Axonometric View
NOTE:
PD B
Purlin Connector "B"
Ricon 200x60 VS
VIEW 3
VIEW 2
Top View
View 2
View 3
Axonometric View
NOTE:
PD C
Purlin Connector "C"
Ricon 200x80 VS
VIEW 3
VIEW 2
Top View
View 2
View 3
Axonometric View
NOTE:
PERMIT TO PRACTICE
ISL Engineering
and Land Services Ltd.
PAGE 2
ISSUED FOR CONSTRUCTION
29. FEB. 2016
STRUCTURLAM PRODUCTS LP.
29. FEB. 2016
GENERIC DETAILS
SL 1.1
5
Rocky Ridge Recreation Facility
Job#20048


Shop Mark GL10

DESIGN ANALYSIS






PD A
SHOP TO INSTALL ALL RICON CONNECTORS
PD B
SHOP TO INSTALL ALL RICON CONNECTORS
PD B4
SHOP TO INSTALL ALL RICON CONNECTORS
RRRF AREA B Job# 20048
Quality Assurance Plan CHECK
August 6, 2015
SL 1 OF 1


A207

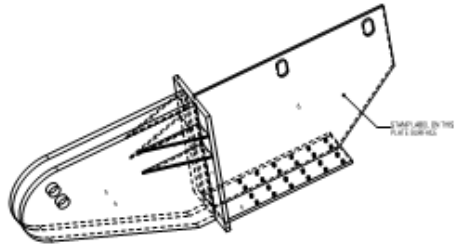

SAFETY


2-TONNE

W7 CONNECTOR SIZE MATRIX						
W7 CON. LABEL	PURLIN BAY	# OF W7'S	BEAM WIDTH	BEAM WEIGHT	CHECK CONNECTOR SIZE (recommended "x" dim)	FINISH SPEC
W7-26x	26	3	375	632		520
W7-23x	23	3	375	632		520
W7-22x	22	3	375	632		520
W7-23x	23	2	375	632		520
W7-26x	26	2	375	632		520
W7-24x	24	3	180	456		520
W7-26F	26	3	375	616		520
9 CONNECTIONS TOTAL						

KEY FOR PLATE ANGLE PICTOGR

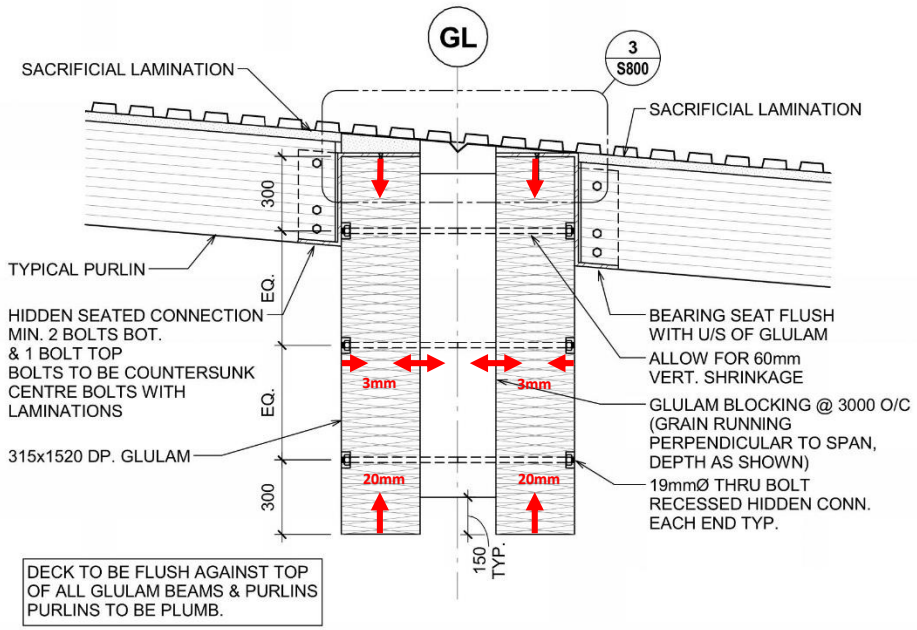
KEY FOR CONNECTOR LABELS

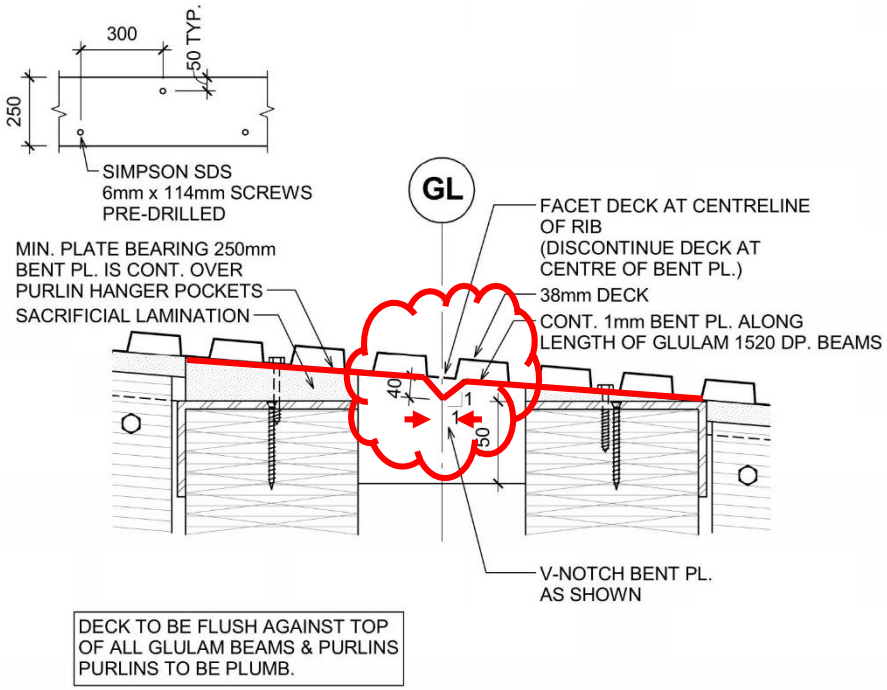


W7 CONNECTOR SIZE MATRIX						
W7 CON. LABEL	PURLIN BAY	# OF W7'S	BEAM WIDTH	BEAM WEIGHT	CHECK CONNECTOR SIZE (recommended "x" dim)	FINISH SPEC
W7-26x	26	4	375	664		520
W7-25F	25	2	375	456		520
6 CONNECTIONS TOTAL						

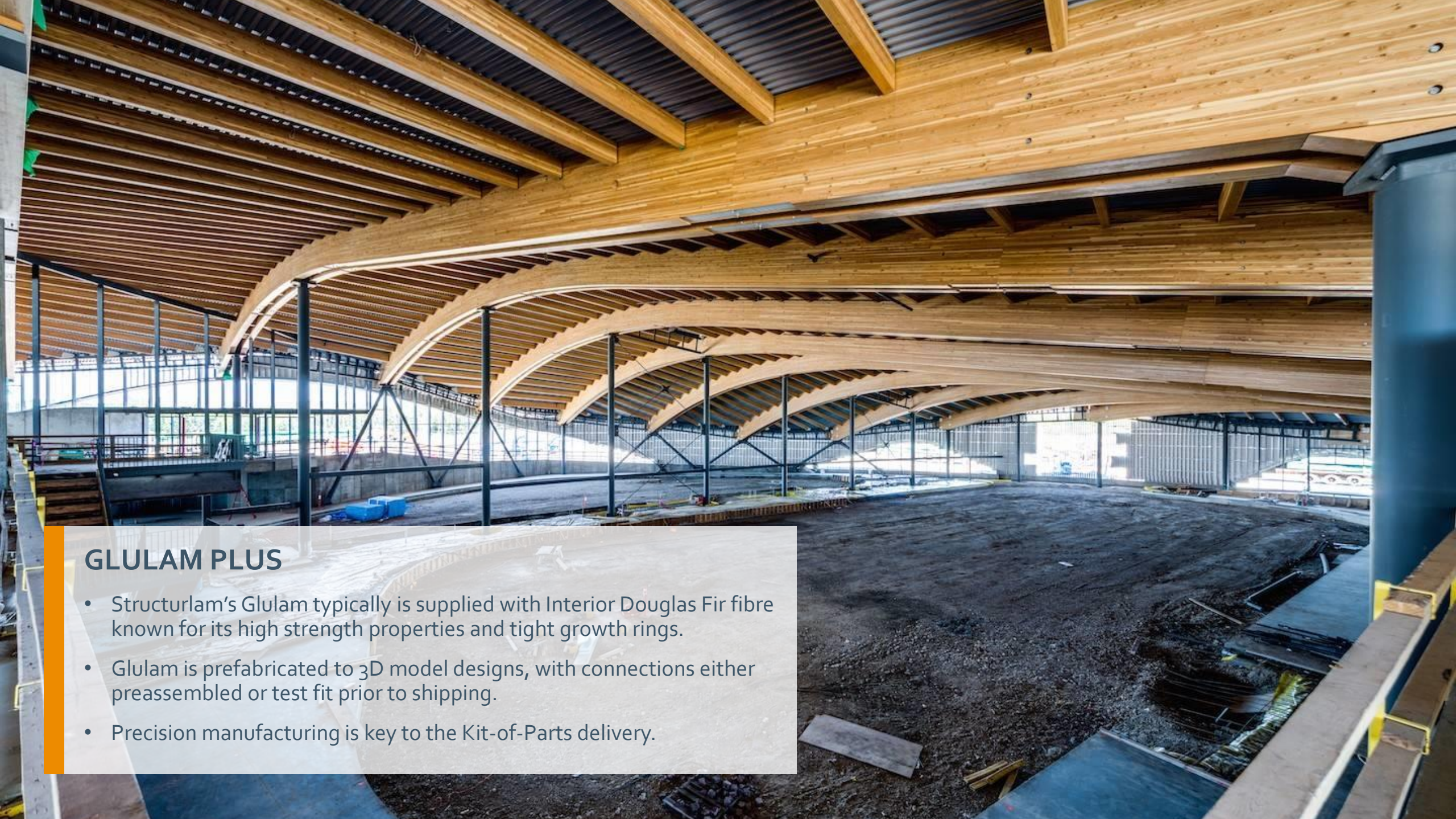
GENERAL NOTES FOR FABRICATION AND QC:

1. SSMP to be used on all connections at locations noted on dr
2. Steel fabricator to be certified in accordance with CSA
3. Steel connections must meet spec 08-1080 Structural
4. Steel connections must meet spec 08-1580 Gluten (F
2.1.10
5. Mill reports to be supplied as requested.
6. Orders will not be accepted without QC measurement
7. Steel plates to be grade 350W.
8. Steel HSS sections to be grade 350W, Class H or C.
9. Welding shall be done by the shielded metal arc reacti
CSA W59. The welding operators shall be current
they are performing.
10. All steel shall be thoroughly cleaned of all loose mill sc
11. All structural steel and steel connection plates shall be
accordance with CSA (CISC/RMA Standard SSPC-SP6 or
unless noted otherwise.
12. Paint all structural steel and steel connection plates in
instructions and as identified in Sections 2.2.4.5.1 and
a) Steel (to all areas except where noted in Section 2.
(i) 1st Coat Alkyd Metal Primer
(ii) Note: Use low VOC outer barrier alkyd meet
b) Steel (exposed or within the waterbarrier) INT 5.1H-
(i) 1st Coat Zinc Rich Inorganic Primer
13. Paint all structural steel and steel connection plates in
08 80 00.
14. All structural steel and steel connection hardware con
Architecturally Exposed Structural Steel (AESS) Categ
Guide for Specifying Architecturally Exposed Structura



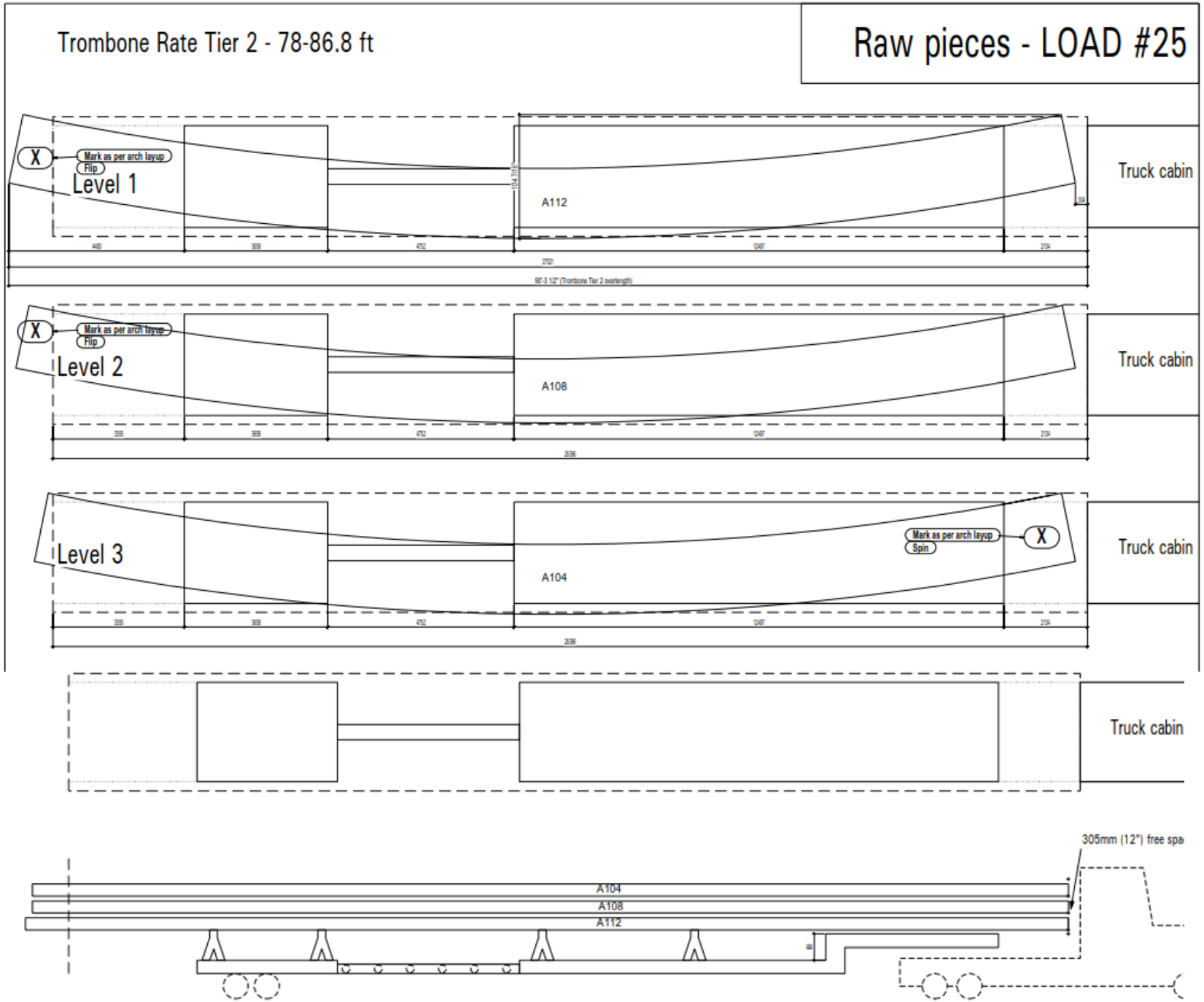


TYPICAL PURLIN TO BEAM DETAIL



GLULAM PLUS

- Structurlam's Glulam typically is supplied with Interior Douglas Fir fibre known for its high strength properties and tight growth rings.
- Glulam is prefabricated to 3D model designs, with connections either preassembled or test fit prior to shipping.
- Precision manufacturing is key to the Kit-of-Parts delivery.


Trombone Rate Tier 2 - 78-86.8 ft
Raw pieces - LOAD #25
Level 1
Mark as per arch layup
Flip
A112
Truck cabin
Level 2
Mark as per arch layup
Flip
A108
Truck cabin
Level 3
Mark as per arch layup
Spin
A104
Truck cabin
Truck cabin
305mm (12") free spa
A104
A108
A112


DEC 2016, -30 C

MAY 2017


AUGUST 2017

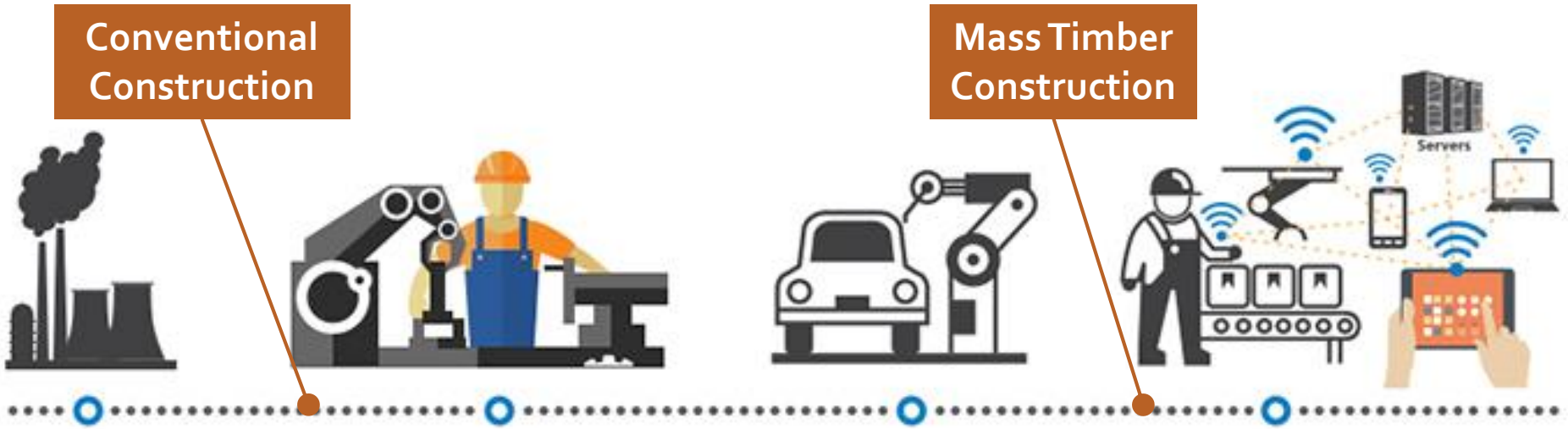
- Completed On-Time
- Completed On-Budget
- Issues: 1 purlin with concrete collision
  - Out of ~ 2000 unique purlins
- Ricon tolerances worked better than expected, no tolerance bay needed
- Precision screw torque on large scale feasible, but not preferred
- Better systems for drilling long precise holes needed
- Mass Timber is the celebration of Structure and bring this project to life


QUATIC CENTRE

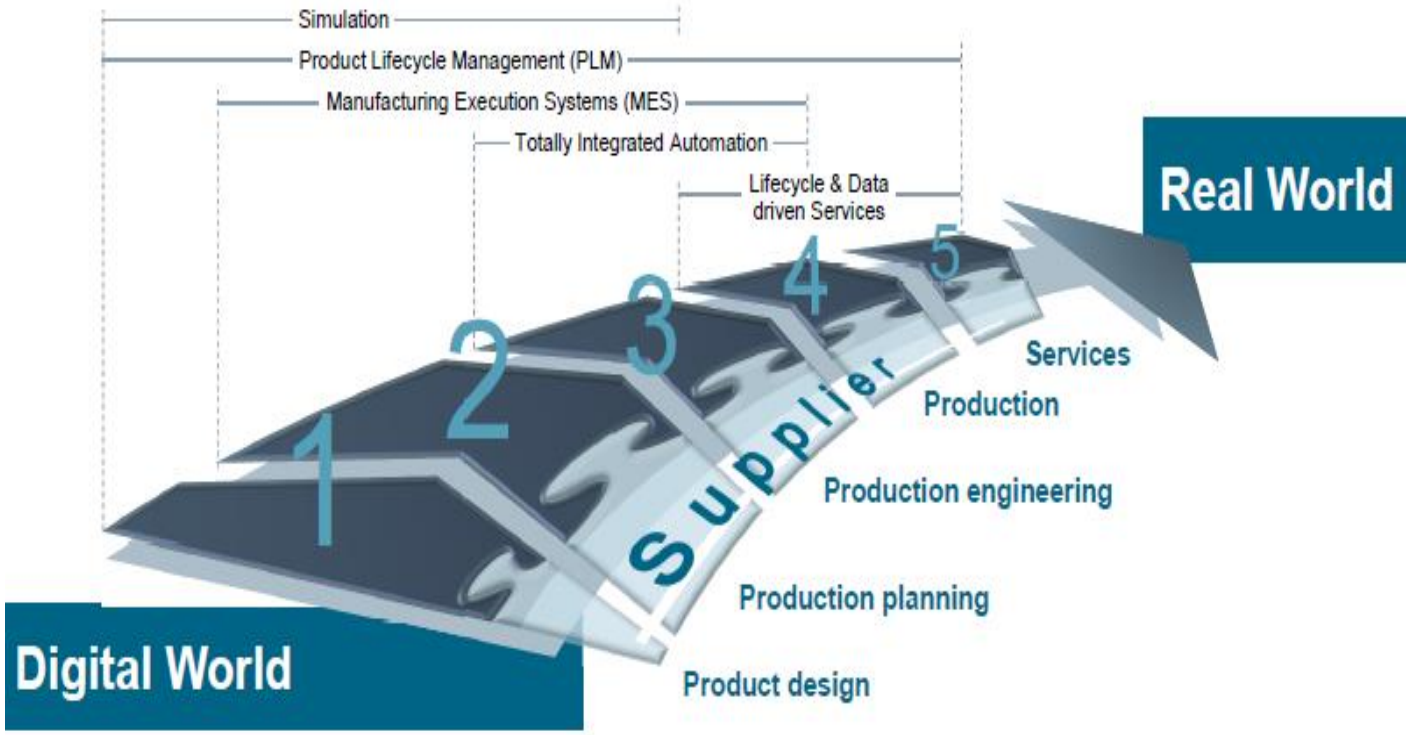

GARED
GARED


enerPLUS arena

INDUSTRY 4.0 & 3.X



STRUCTURLAM
MASS TIMBER CORPORATION



Intelligent Production Control Systems (IPCS)

INDUSTRY 3.X

- 3D BIM driven models
- Semi-automated design processes
  - Parametric systems
- Electronic document transfer and order input
- Automated production information
- Semi-autonomous CNC machines
- Integrated quality assurance
- Just In Time shipping

STRUCTURLAM
MASS TIMBER CORPORATION

PROJECT DEPLOYMENT

In-house team based design services

- Design for cost, manufacturing and assembly
- Engineering partnerships directed by manufacturer
- Mitigate uncertainty, expedite schedules

Integrated 3D BIM Teams

- Team consultants (Arch, Eng, GC)
- General BIM Manager (usually by GC)
- Internal project BIM manager - SMTC
  - Potential outsourced partner teams

Simplified installation

- Kit of parts
- Just in time delivery
- Logistical optimization with Industry 3.x tools

MASS TIMBER is the link between Construction and TECH INDUSTRIES

We are a Tech-Manufacturing company.

FIRST TECH CREDIT UNION

Hacker, Swinerton, KGA

Hillsboro, OR

- 14,500 m² Office Space, 5 stories
- 5 months from contract to first deliveries
- Prefabrication with MEP, 4500 holes:
- CrossLam CLT provided best value proposition to client over comparable concrete and steel options, 4% savings!
- Self performed, 12 weeks total install time for Mass Timber

CARBON 12

Kaiser Group

Portland, OR

- 8 story residential tower
- First Tall Wood project in the United States
- 242 panels installed in 70 days
- Hybrid Steel Brace Frame Core
- Steel and Mass Timber coordinated in one fabrication level Building Information Model

Brock Commons

Acton Ostry, Fast+Epp, UrbanOne

Vancouver, BC

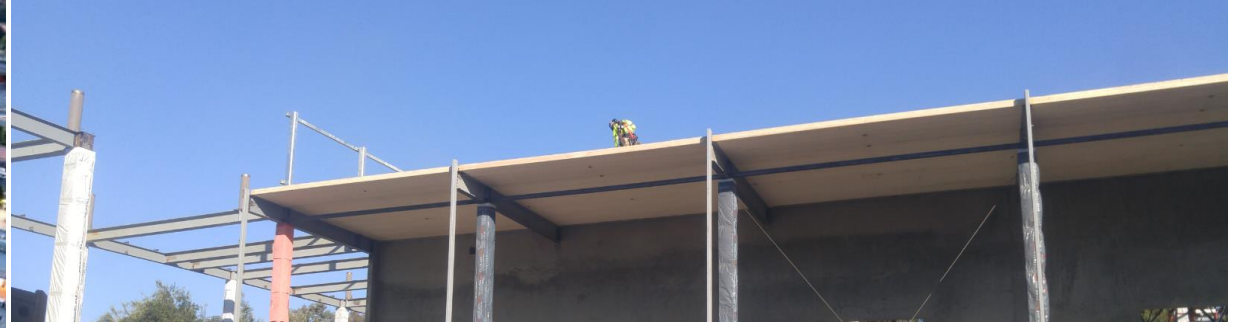
- 2 months to fabricate, 2 months to erect
- Possible 3m x 4.5m grid (10’ x 15’)
- Record setting Mass Timber Hybrid building at 53 m 18 stories, true 2 way span CLT.
- Fully pre-designed and coordinated BIM system

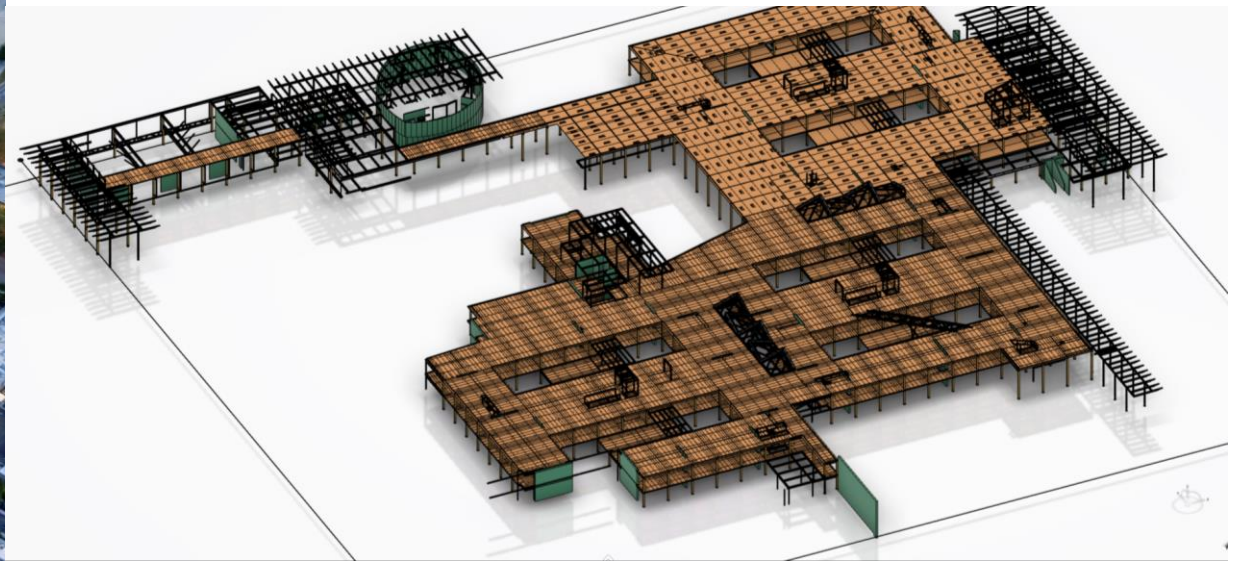
Virtuoso

Adera Developments

Vancouver, BC

- 6 story residential light frame
- First full Hybrid (MT + LF)
- Quite floor system to complete with concrete
- Costs competitive to North American Metrics
- 4 month schedule savings





Mountain View Tech Campus

WRNS, Holmes, R&S

San Francisco, California

- 38,500 m² Office Space, 2 stories
- 3 months planned installation timeline
- Prefabrication with MEP, 4000 holes:
- CrossLam CLT and composite concrete structure with compression fit steel plates
- Over 6000 coordinated Nelson stud points

How can STRUCTURLAM elevate your next project?

www.structurlam.com

STRUCTURLAM
Intelligence In Wood