1693-05-TQS-8026_0

Site Technical Query - Form

SN1809-0000/XE.FRM/0001 Rev 4 03/02/2021

TQ Number:			Project:
CW2144960	**-A010-**	**0051**	**Oyu Tolgoi Underground Project**

A. To be completed by or on behalf of the Contractor

Contractor/Sub-Contractor Name:	MCS International	Date Response	18/01/2022
Contract Title:	Booster Fan installations	Plant Area &	1693
Contract No.	CW2144960	Contractor TQ Number:	BF-0415-TQ-0051

Discipline Codes (Mandatory) **D1** (CSA) - ☐ **D2** (MP) - ☒ **D3** (E&I) - ☐ **D4** (Other) - ☐

Description of Technical Query (List affected drawings and specifications):

HVAC condenser 1693-SRM-2001-AHU-CNDA support

E-room HVAC Condenser 1693-SRM-2001-AHU-CNDA unit will be installed on top of 1693-SRM-2001-AHU-CNDB unit as per TQ-0045. Therefore, suitable base supports will be needed for the HVAC condenser 1693-SRM-2001-AHU-CNDA.

☐ Routine ☒ Urgent Refer Technical Query instructions

Proposed Action (List all attachments)

The contractor is proposed the following options.

1. Install the 1693-SRM-2001-AHU-CNDA unit on the wall with a triangular support. The design and calculations are attached in the appendix.
2. Each base support with two legs anchored to the floor. Place the condenser 1693-SRM-2001-AHU-CNDB at the lower level and the condenser 1693-SRM-2001-AHU-CNDA on the upper level on 2ea base support. Each support with two legs anchored to the floor. Design and calculations are attached.

Effect on cost (USD):	YES		
Effect on schedule (Days):	NO		
Effect on quality:	NO		
Requested by (Name):	Delgersuren.N	Position:	SMP Engineer
Signature:	Namkhainyamba Delgersuren 2022.01.18 10:53:36 +08'00'	Date: *(dd/mm/yyyy)*	18/01/2022

B. To be completed by Jacobs Field Engineer

Comments/recommendations by Engineering

Proposal #1 is acceptable with the comment.

-The marked in green colour in this TQ page number #7.

-The materials used for the supports shall be in accordance with the project specifications.

-Capture changes in redlines.

Disclaimer:
Acceptance or rejection of this TQ is only related with technical aspects.
If Cost or Schedule Impact are associated with this TQ, it must be discussed separately with Jacobs Contract team.

C. Engineering Decision		D. Information		
■	☐	☐	☐	☐
Accept with comments	Reject	**Design Change** Distribute to: Design Author DA	**Cost Impact** Distribute to: Contracts, Proj. Controls & Construction Manager	**Schedule Impact** Distribute to: Proj. Controls & Construction Manager

REVIEWER Field Engineer OR Lead Engineer	APPROVER Lead Engineer OR Chief of Engineering	CONSTRUCTION MANAGER (If **Cost** and/or **Schedule** Impact)
Baatar Byambajav Digitally signed by Baatar Byambajav DN: cn=Baatar Byambajav, c=MN, o=Worley, ou=Field Engineer-CSA, email=Baatar.Byambajav@worley.com Date: 2022.01.21 13:03:17 +08'00'	Martin Smith Digitally signed by Martin Smith DN: cn=Martin Smith, c=MN, o=Worley, ou=Lead Engineer, email=Martin.G.Smith@Worley.com Date: 2022.01.21 13:38:09 +08'00'	
Date: *(dd/mm/yyyy)*	Date: *(dd/mm/yyyy)*	Date: *(dd/mm/yyyy)*

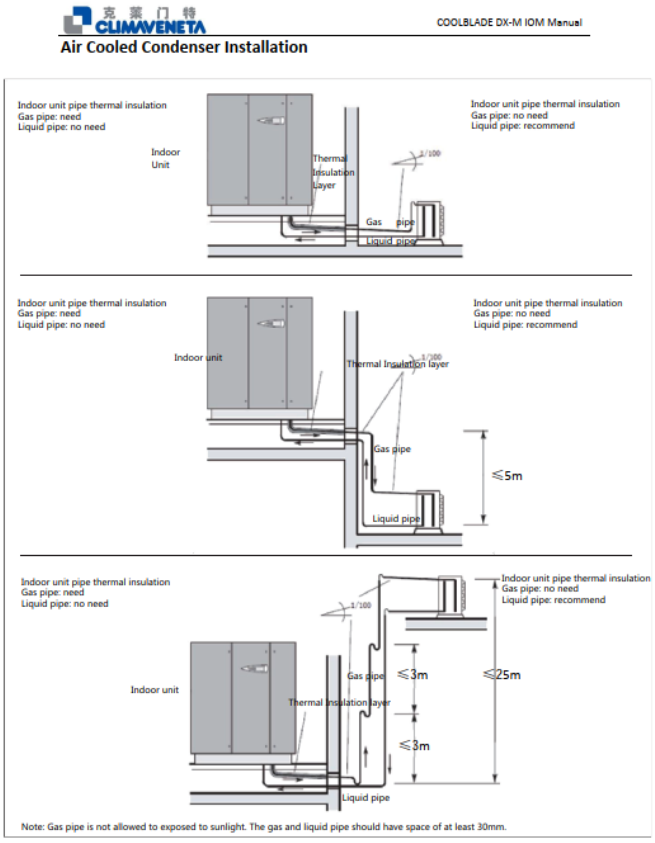
B. To be completed by Jacobs Field Engineer

Comments/recommendations by Engineering

Proceed as **OPTION#2** with following comments:

- This TQ is accepted only for location of the condenser unit 1693-SRM-2001-AHU-CNDA.

- The Contractor shall be provided gas and liquid pipe route as per Manufacturer recommendation which shows Page-77 on 1693-65-IOM-1500. Prior to installation, separate TQ shall required and confirmed by Worley Reps.



- The Contractor shall be provided Mounting Detail of this relocated condenser unit. Prior to installation, separate TQ shall required and confirmed by Worley Reps.
- Changes shall be redlined on all relevant drawings.

Disclaimer:

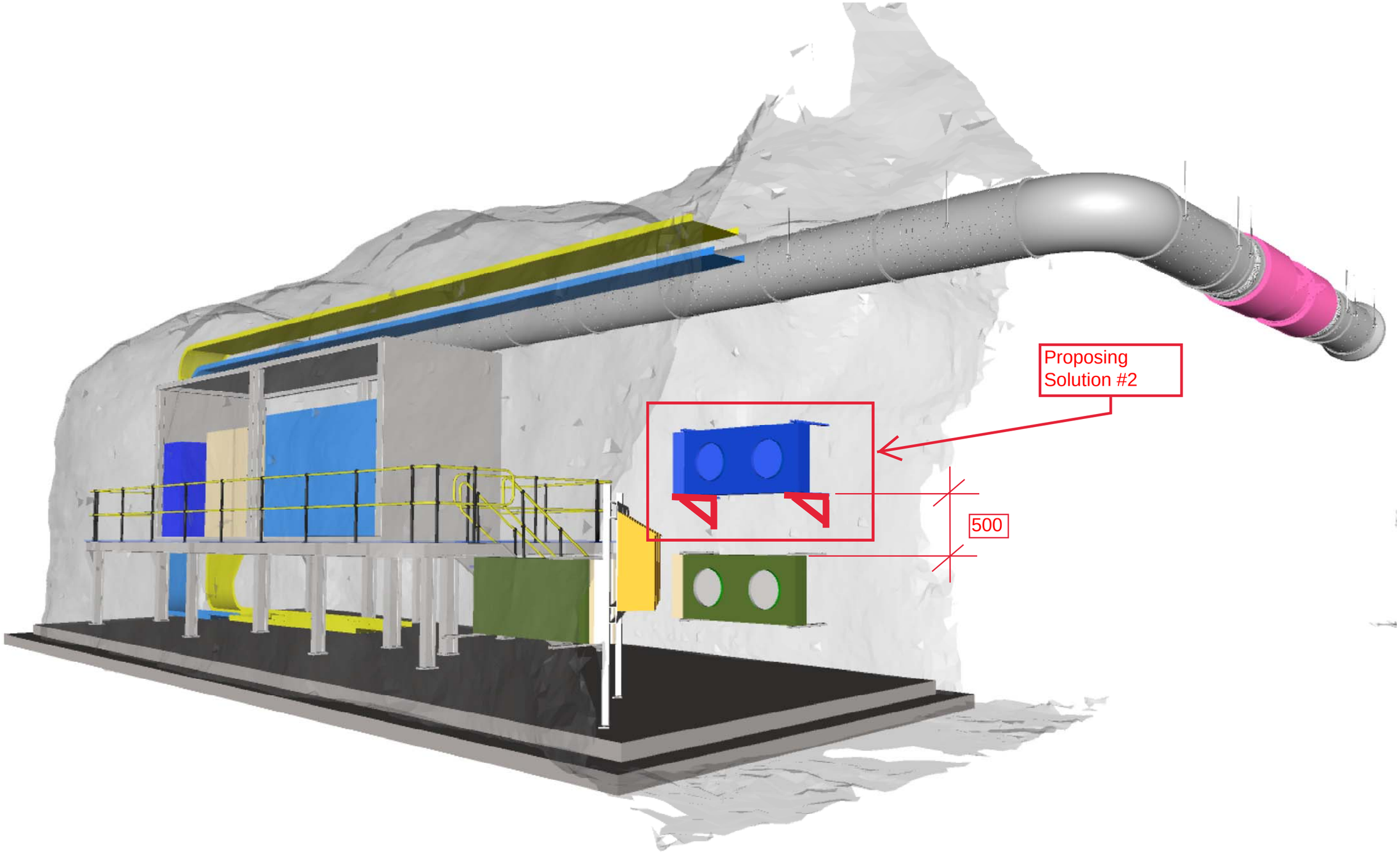
Acceptance or rejection of this TQ is only related with technical aspects.

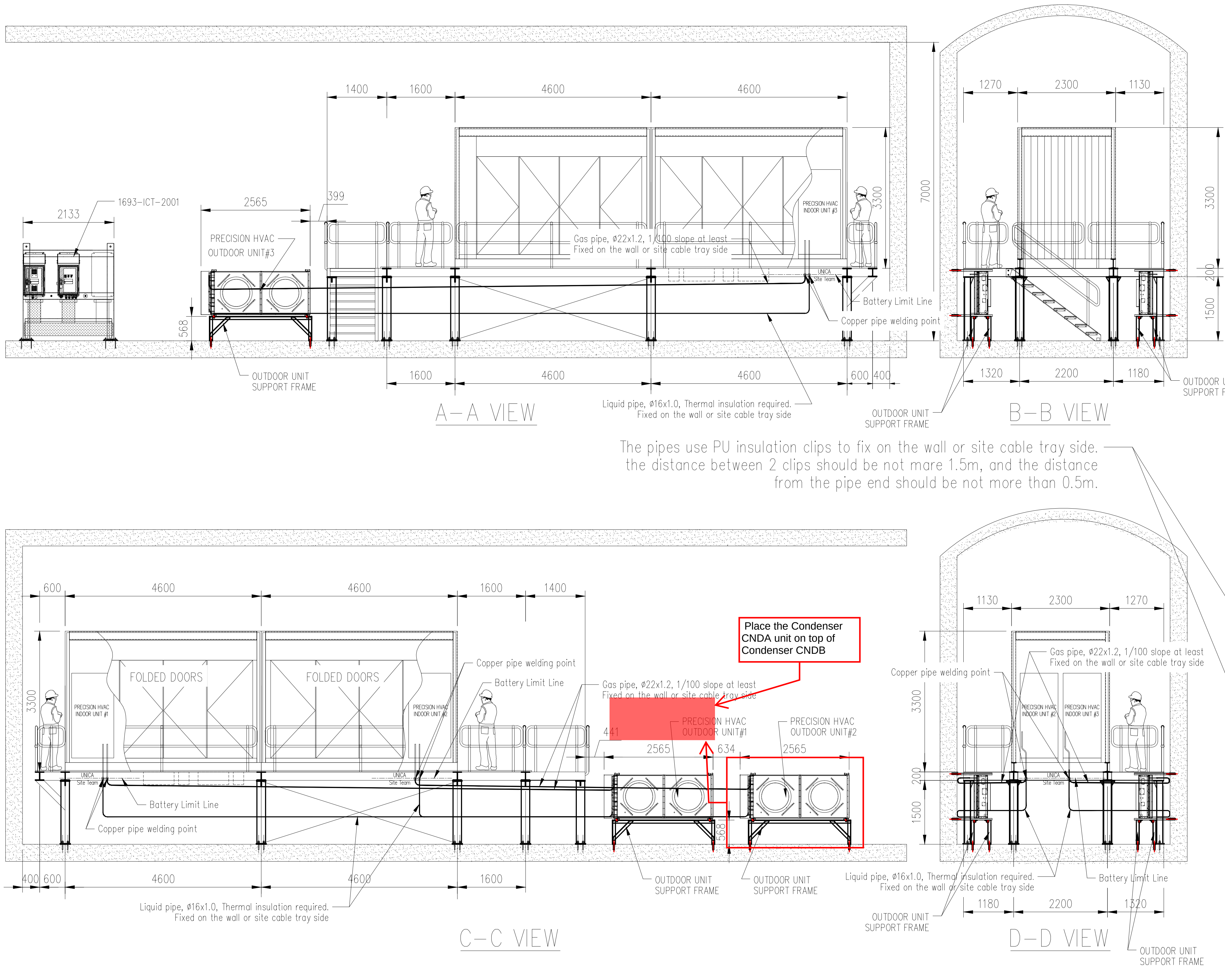
If Cost or Schedule Impact are associated with this TQ, it must be discussed separately with Jacobs Contract team.

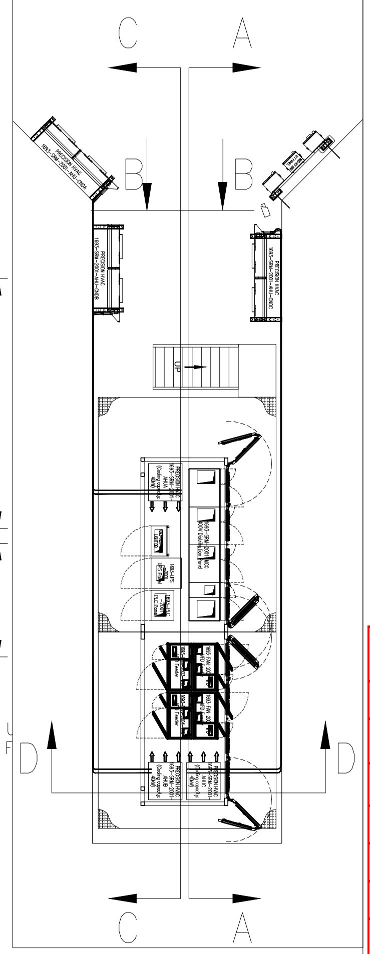
C. Engineering Decision		D. Information		
☑	☐	☐	☐	☐
Accept with comments	Reject	**Design Change** Distribute to: Design Author DA	**Cost Impact** Distribute to: Contracts, Proj. Controls & Construction Manager	**Schedule Impact** Distribute to: Proj. Controls & Construction Manager

REVIEWER Field Engineer OR Lead Engineer		APPROVER Lead Engineer OR Chief of Engineering		CONSTRUCTION MANAGER (If **Cost** and/or **Schedule** Impact)	
	Delger Erdenechuluun		Boldbaatar.M		
Date: *(dd/mm/yyyy)*	2022.01.13 15:25:53 +08'00'	Date: *(dd/mm/yyyy)*	2022.01.13 15:10:48 +08'00'	Date: *(dd/mm/yyyy)*	

TQ-0045







1693-SRM-2001 PLAN

PU Insulation Pipe Clips, suitable to fixed on the C type steel

JACOBS	Contractor/Supplier/Vendor Technical Document and Drawing Review for SN1809A0 - OT Underground Project	Oyu Tolgoi
☑ 1	Reviewed with No Comments. (Construction/Fabrication may Proceed)	
☐ 2	Reviewed with Minor Comments. Revise and resubmit "Final Version" incorporating comments. (Construction/Fabrication may proceed thereafter)	
☐ 3	Rejected with Major Comments. Correct and resubmit "For Review" incorporating comments. (DO NOT PROCEED with Construction or Fabrication)	
☐ 4	Not Reviewed - Received For Information Only. No further submission is required.	
☐ 5	Received Certified/Equipment Package Vendor Document. Received As Built - Contractor Document.	
☐ 6	Cancelled.	
☐ YES ☐ NO	Submit Certified Document.	
Responsible Engineer	Name / Signature / Date	Digitally signed by Andrew Stonehouse DN: cn=Andrew Stonehouse, c=AU, o=Worley, ou=Energy, Chemicals and Resources, email=andrew.stonehouse@worley.com Date: 2021.05.21 17:30:03 +10'00'
Equipment Tag No.		
Client Document No.	1693-35-C2-1500	
Jacobs Document No. and Revision	CW2100223-1690-B005-0146_R4	

AUTHORISATION TO PROCEED DOES NOT RELIEVE THE VENDOR/CONTRACTOR OF ANY RESPONSIBILITY, OBLIGATION OR LIABILITY UNDER THE PURCHASE ORDER/CONTRACT. NO RESPONSIBILITY IS ASSUMED BY JACOBS FOR CORRECTNESS OF DIMENSIONS OR DETAILS. SHOP DRAWINGS ARE ACCEPTED AS FOR INFORMATION ONLY (NOT REVIEWED). VENDOR/CONTRACTOR IS FULLY RESPONSIBLE FOR SHOP DRAWINGS.

NOTE:
Refrigerant piping shall be seamless copper alloy tubing conforming to applicable ASTM B280 and ANSI B315 or equivalent. Refrigerant piping shall be installed in accordance with ASHRAE 15

UNICA (SHANGHAI)
Integrated Electrical Equipment Co., Ltd.

Tag No.	1693-SRM-2001
Vendor Drawing No.	1693-SRM-2001_HVAC-PIPING
Jacobs Document No. and Revision	CW2100223-1690-B005-0146_3
Howden Document No	L000916-6209
VDRS Code:	B005

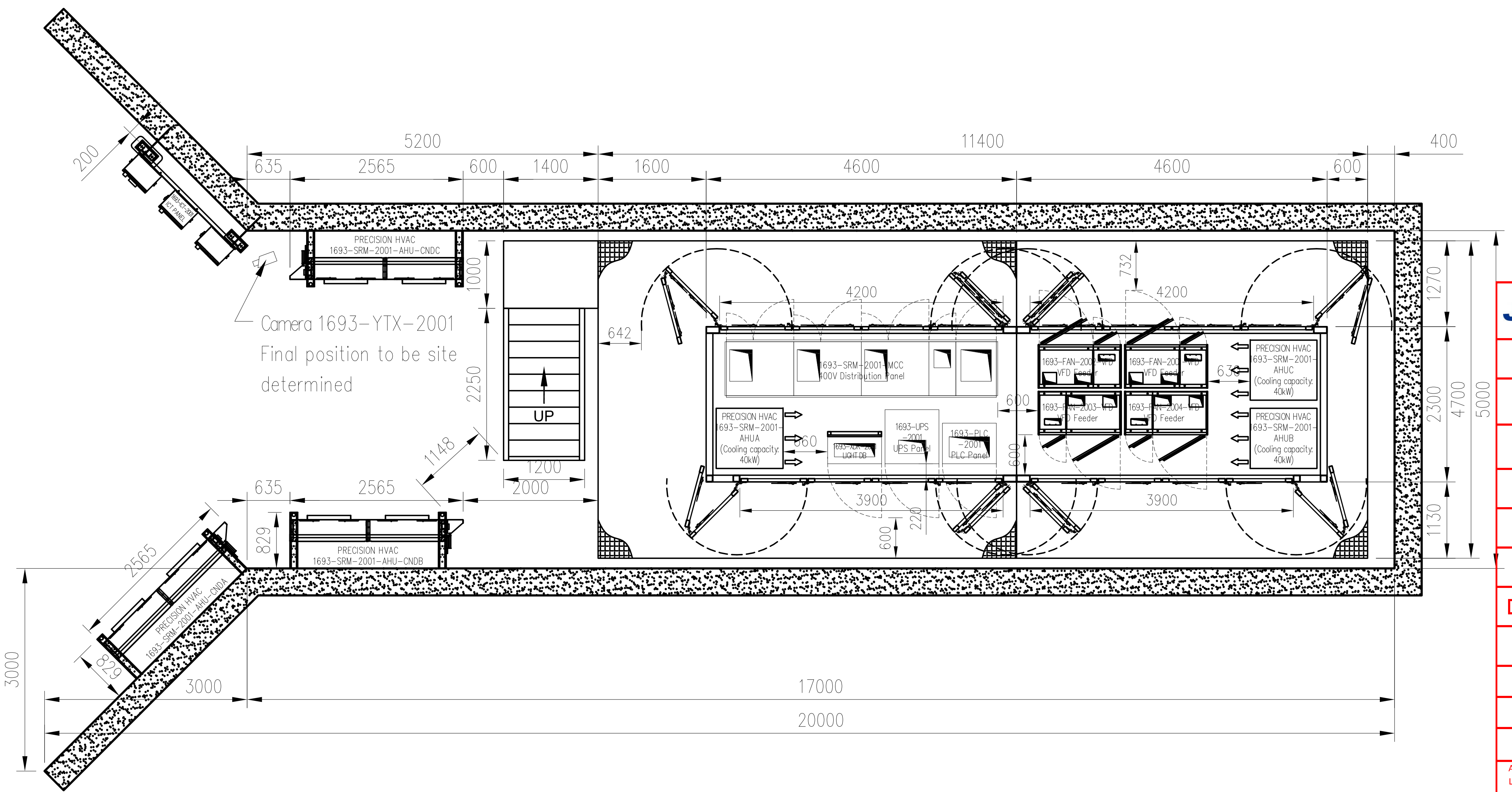
REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REFERENCE DRAWING No.	REFERENCE DRAWINGS
0	03/02/2021	ISSUED_FOR_CONSTRUCTION	CC YB	ZYZ						1693-65-G2-1513	GENERAL_ARRANGEMENTS_&_LAYOUT_DRAWINGS
1	04/15/2021	ISSUED_FOR_CONSTRUCTION	CC YB	ZYZ						1693-65-K2-1503	ELECTRICAL_RACKING_&_ROUTING_DIAGRAM
										1693-65-Q1-1500	LIGHTING_LAYOUT_DIAGRAM
										1693-IOM-1500	IOM

Oyu Tolgoi — OYU TOLGOI LLC — ОЮУ ТОЛГОЙ ХХК

PRODUCED BY: UNICA	DESIGNED BY: UNICA	DRAWN BY: YB
PROJECT NO: –	CHECK DESIGN: ZYZ	CHECK DRAWING: ZYZ
CONTRACT NO: –	LEAD ENGINEER: KJ	APPROVAL DATE: –
DRAWING SIZE: A3	AREA PROJECT ENG: –	ENG MANAGER: –
PLOT SCALE: 1:80@A3	PROJECT MANAGER: DSH	APPROVAL DATE: –
CAD FILE NAME: SHAFT#3&4-UG_XS	CLIENT: OYUTOLGOI.LLC	APPROVAL DATE: –

OYU TOLGOI UNDERGROUND PROJECT
UNDERGROUND ELECTRICAL AND INSTRUMENTATION
HIGH SPEED NORTH INTAKE BOOSTER FAN ELECTRICAL ROOM
HVAC LAYOUT DRAWINGS(1693-SRM-2001-AHUA/AHUB/AHUC)

SCALE	DRAWING NUMBER	REV.
1:100@A3	1693-35-C2-1500	1



Contractor/Supplier/Vendor Technical Document and Drawing Review for SN1809A0 - OT Underground Project		
☑	1	Reviewed with No Comments. (Construction/Fabrication may Proceed)
☐	2	Reviewed with Minor Comments. Revise and resubmit "Final Version" incorporating comments. (Construction/Fabrication may proceed thereafter)
☐	3	Rejected with Major Comments. Correct and resubmit "For Review" incorporating comments. (DO NOT PROCEED with Construction or Fabrication)
☐	4	Not Reviewed - Received For Information Only. No further submission is required.
☐	5	Received Certified/Equipment Package Vendor Document. Received As Built - Contractor Document.
☐	6	Cancelled.
YES ☑ NO ☐		Submit Certified Document.
Responsible Engineer		Name / Signature / Date — Digitally signed by Henry Doubell DN: cn=Henry Doubell, c=MN, o=Worley, ou=E&I Field Engineering, email=henry.doubell@Worley.com Date: 2020.07.25 15:39:16 +08'00'
Equipment Tag No.		
Client Document No.		1693-65-G2-1513
Jacobs Document No. and Revision		CW2100223-1690-B001-0003_R6

AUTHORISATION TO PROCEED DOES NOT RELIEVE THE VENDOR/CONTRACTOR OF ANY RESPONSIBILITY, OBLIGATION OR LIABILITY UNDER THE PURCHASE ORDER/CONTRACT. NO RESPONSIBILITY IS ASSUMED BY JACOBS FOR CORRECTNESS OF DIMENSIONS OR DETAILS. SHOP DRAWINGS ARE ACCEPTED AS FOR INFORMATION ONLY (NOT REVIEWED). VENDOR/CONTRACTOR IS FULLY RESPONSIBLE FOR SHOP DRAWINGS.

Scope of Supply and Equipment dimension and weight List

1693-SRM-2001

TAG NO.	EQUIPMENT DESCRIPTION	QTY.	DIMENSION (WxDxH)(mm)	WEIGHT (KG)	Heat Loss (W)	REMARKS
1693-SRM-2001-MCC	400V Distribution Panel	5	4046x852x2260	1950	2312	
1693-PLC-2001	PLC Panel	1	800x600x2300	300	300	
1693-UPS-2001	UPS Panel	1	800x800x2000	650	900	
1693-XDR-2001	Lighting DB	1	800x400x1200	200	100	
1693-ICT-2001	ICT PANEL	1	600x614x800	300	300	By Customer, installed on other location
1693-FAN-2001-VFD	VFD Feeder	1	1230x600x2150	1200	15000	
1693-FAN-2002-VFD	VFD Feeder	1	1230x600x2150	1200	15000	
1693-FAN-2003-VFD	VFD Feeder	1	1230x600x2150	1200	15000	

Scope of Supply and Equipment dimension and weight List

1693-SRM-2001

TAG NO.	EQUIPMENT DESCRIPTION	QTY.	DIMENSION (WxDxH)(mm)	WEIGHT (KG)	Heat Loss (W)	REMARKS
1693-FAN-2004-VFD	VFD Feeder	1	1230x600x2150	1200	15000	
1693-SRM-2001-AHUA	Precision HVAC Indoor Unit 1	1	890x990x1990	330	0	
1693-SRM-2001-AHU-CNDA	Precision HVAC Condenser 1	1	2565x829x1100	125	0	
1693-SRM-2001-AHUB	Precision HVAC Indoor Unit 2	1	890x990x1990	330	0	
1693-SRM-2001-AHU-CNDB	Precision HVAC Condenser 2	1	2565x829x1100	125	0	
1693-SRM-2001-AHUC	Precision HVAC Indoor Unit 3	1	890x990x1990	330	0	
1693-SRM-2001-AHU-CNDC	Precision HVAC Condenser 3	1	2565x829x1100	125	0	
	TOTAL:			9565	63912	

NOTE:

1. Cuddy ventilation should be considered. The ventilation should cover all equipment heat dissipation, which include HVAC units, and all other equipment that does not be installed in the kiosk. Each HVAC unit heat dissipation is 43kW, Two HVAC units is 86kW (N+1 Redundancy mode, 2 units running and 1 unit standby)
2. All equipment heat loss in above list is provided by ABB. Heat emission for VFDs is based on the max shaft power from customer.
3. The HVAC indoor unit will use bottom air supply and top air return. So a frame will be used for HVAC indoor unit.
4. All handrails and stairs are removable.

LEGEND:-

- Cutout with Gland Box
- Cutout with Gland Plate
- 5kg CO_2 Fire Extinguisher

A B C D

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Integrated Electrical Equipment Co., Ltd.

Tag No.	1693-SRM-2001
Vendor Drawing No.	1693-SRM-2001_GA_0
Jacobs Document No. and Revision	CW2100223-1690-B001-0003_R5
Howden Document No	L000916-6201
VDRS Code:	B001

REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REFERENCE DRAWING No.	REFERENCE DRAWINGS
0	09/07/2020	ISSUED_FOR_CONSTRUCTION	ZJM YB	ZYZ						1693-65-G2-1515	ELEVATION_DRAWINGS

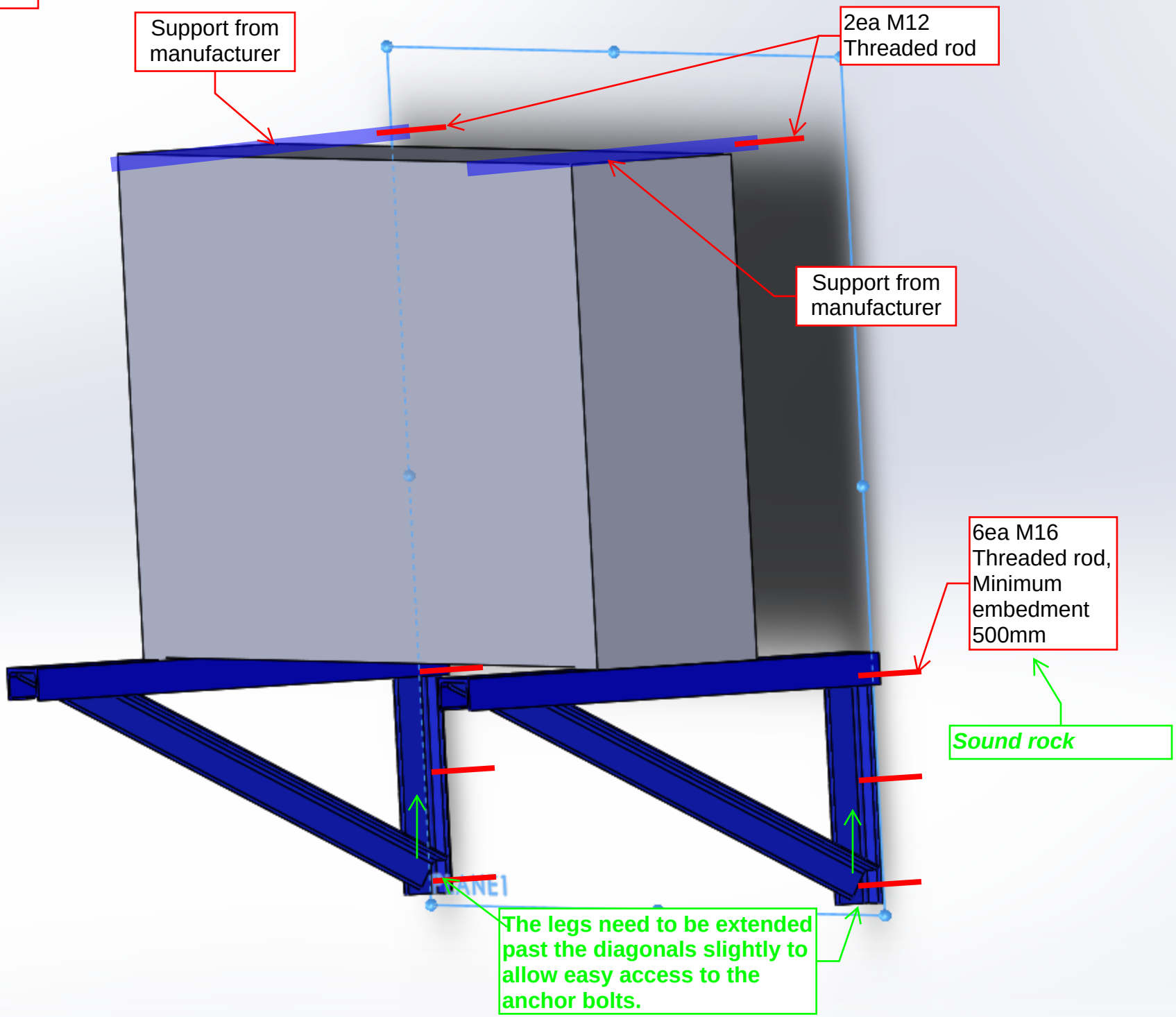
OYU TOLGOI LLC
ОЮУ ТОЛГОЙ ХХК

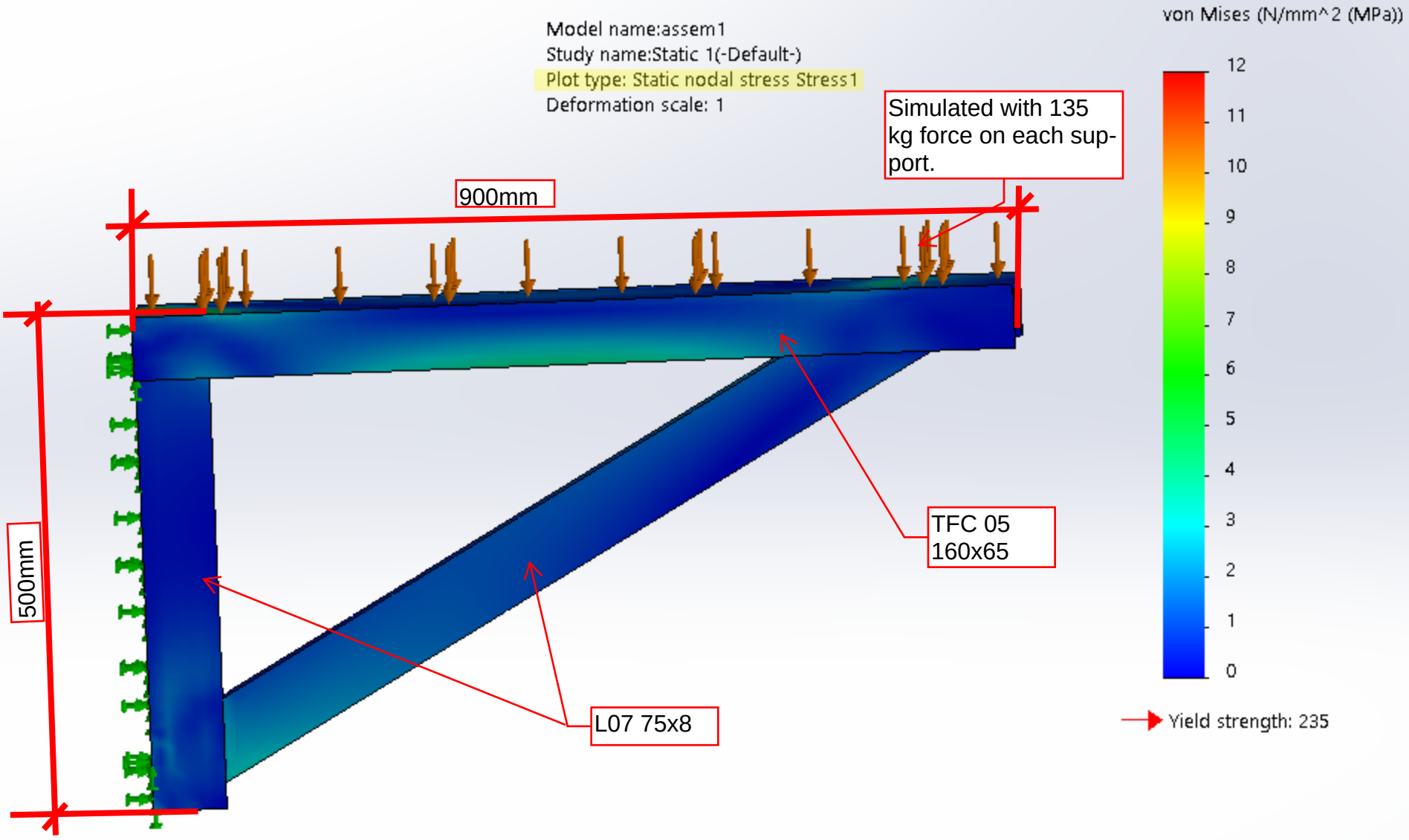
PRODUCED BY: UNICA	DESIGNED BY: UNICA	DRAWN BY: MYF
PROJECT NO: –	CHECK DESIGN: ZYZ	CHECK DRAWING: ZYZ
CONTRACT NO: –	LEAD ENGINEER: KJ	APPROVAL DATE: –
DRAWING SIZE: A3	AREA PROJECT ENG: –	ENG MANAGER: –
PLOT SCALE: 1:80@A3	PROJECT MANAGER: DSH	APPROVAL DATE: –
CAD FILE NAME: SHAFT#3&4-UG_GA	CLIENT: OYUTOLGOI.LLC	APPROVAL DATE: –

OYU TOLGOI UNDERGROUND PROJECT
UNDERGROUND ELECTRICAL AND INSTRUMENTATION
HIGH SPEED NORTH INTAKE BOOSTER FAN ELECTRICAL ROOM
1693-SRM-2001 GENERAL ARRANGEMENTS & LAYOUT DRAWINGS

SCALE	DRAWING NUMBER	REV.
1:80@A3	1693-65-G2-1513	0

OPTION 1


Support from manufacturer
2ea M12 Threaded rod
Support from manufacturer
6ea M16 Threaded rod, Minimum embedment 500mm
Sound rock
The legs need to be extended past the diagonals slightly to allow easy access to the anchor bolts.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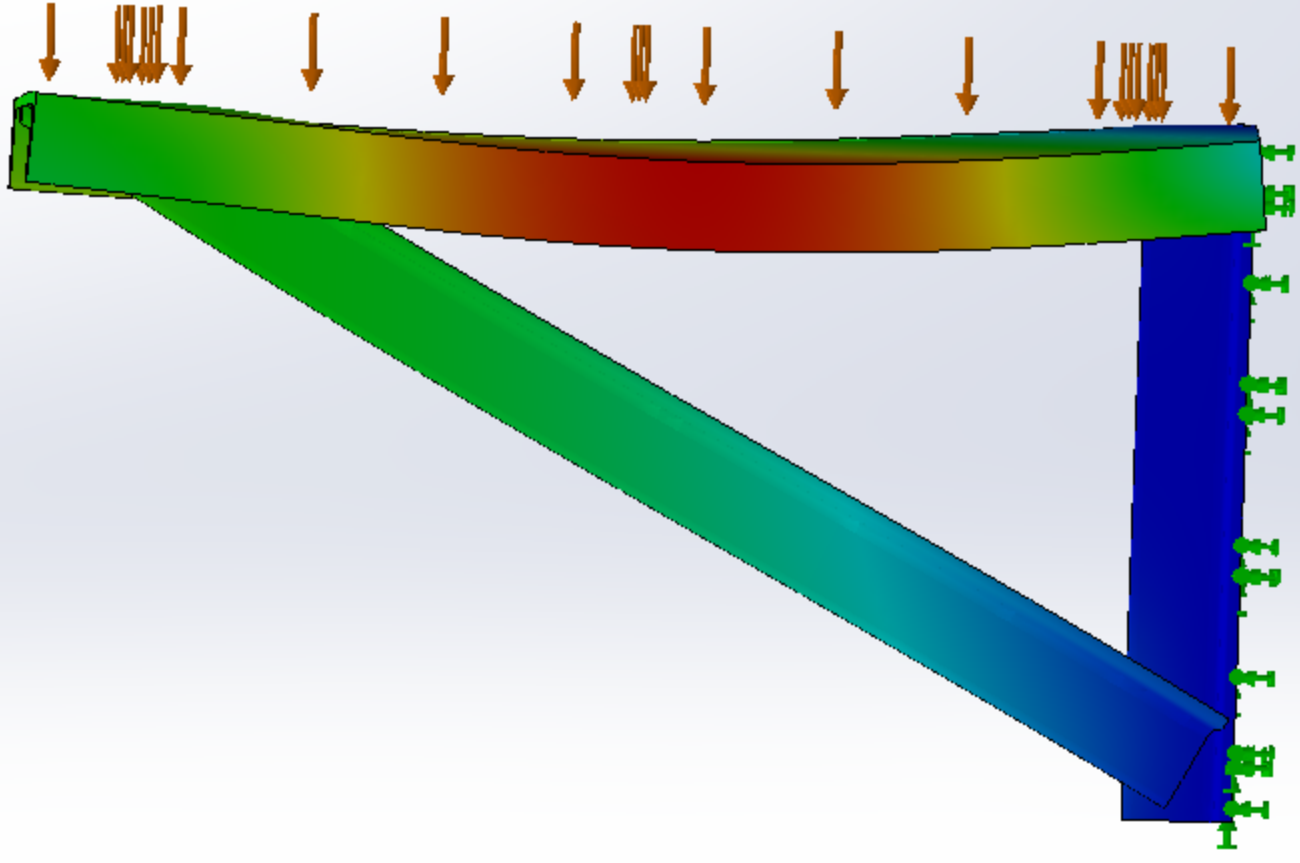
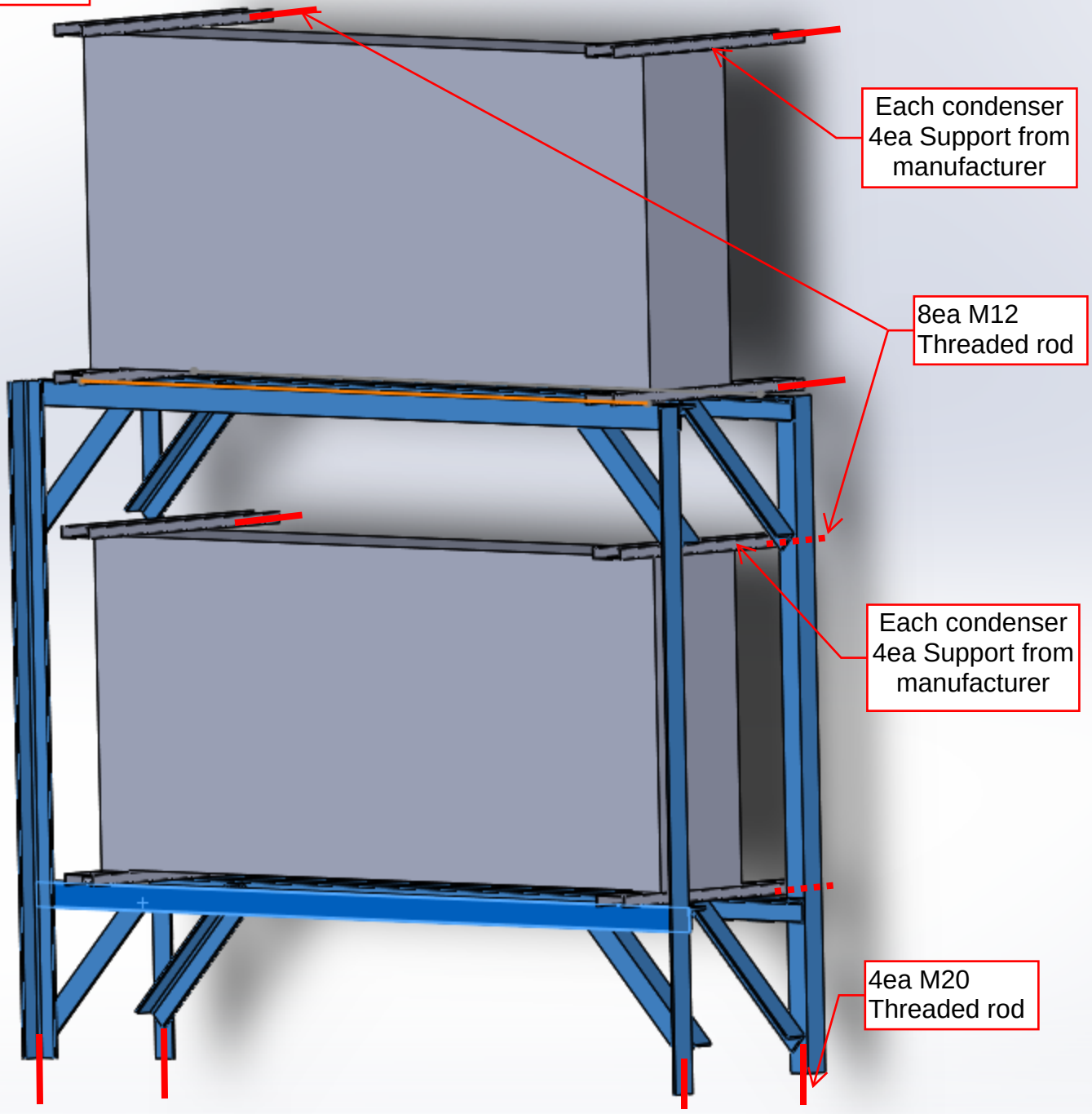
Study name:Static 1(-Default-)
Plot type: Static nodal stress Stress1
Deformation scale: 1
Simulated with 135 kg force on each support.
900mm
500mm
TFC 05 160x65
L07 75x8
von Mises (N/mm^2 (MPa))
12
11
10
9
8
7
6
5
4
3
2
1
0
Yield strength: 235

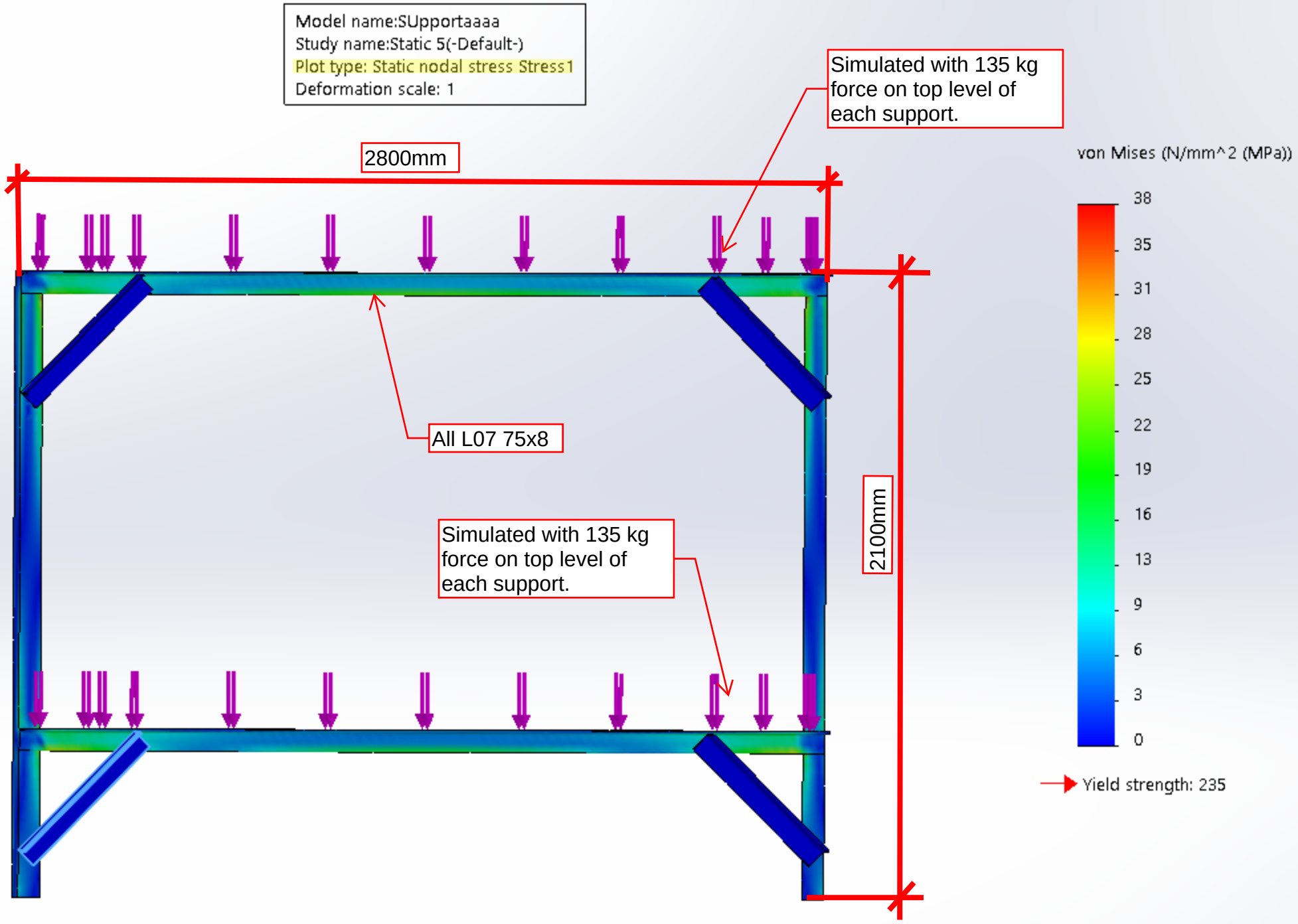
Model name:assem1
Study name:Static 1(-Default-)
Plot type: Static displacement Displacement1
Deformation scale: 1000



URES (mm)
0.042
0.038
0.035
0.031
0.028
0.024
0.021
0.017
0.014
0.010
0.007
0.003
0.000

OPTION 2


Each condenser
4ea Support from
manufacturer
8ea M12
Threaded rod
Each condenser
4ea Support from
manufacturer
4ea M20
Threaded rod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Study name:Static 5(-Default-)
Plot type: Static nodal stress Stress1
Deformation scale: 1
Simulated with 135 kg force on top level of each support.
2800mm
All L07 75x8
Simulated with 135 kg force on top level of each support.
2100mm
von Mises (N/mm^2 (MPa))
38
35
31
28
25
22
19
16
13
9
6
3
0
Yield strength: 235