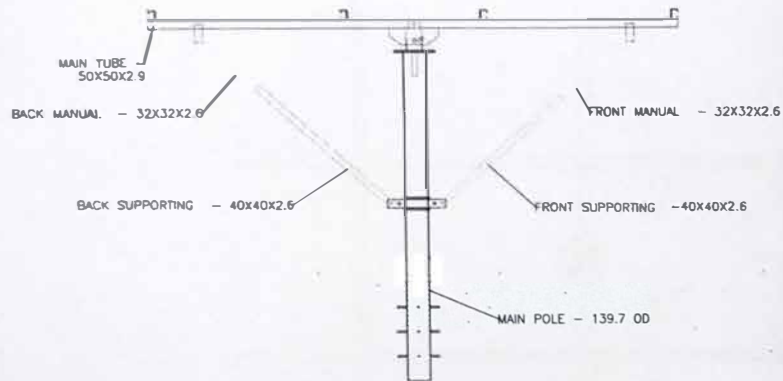
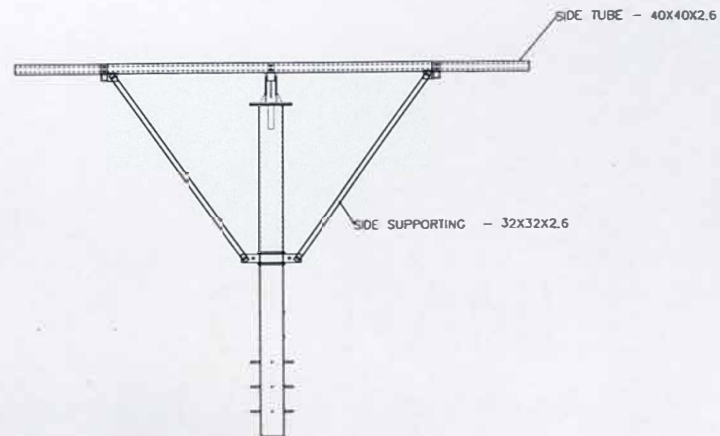


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SIDE VIEW



FRONT VIEW

6 PANEL

Structural design proof checked
and found satisfactory

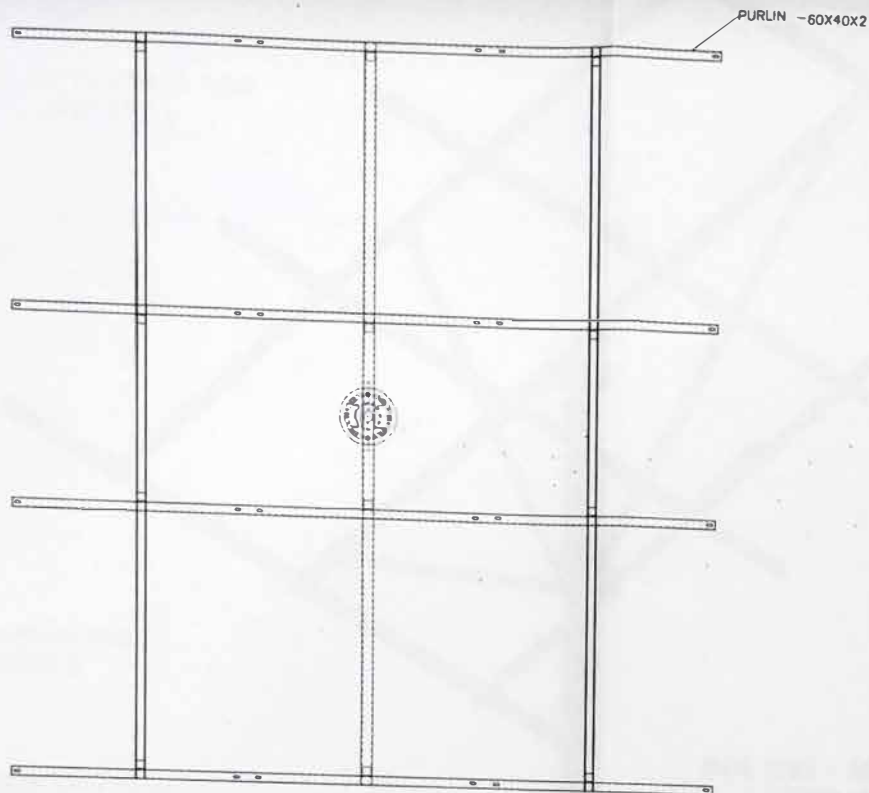
AS



Dr. S. Arul Jayachandran
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RAYDEAN INDUSTRIES, JAIPUR			
CLIENT NAME	VTECH SUNSYSTEMS PVT. LTD.		
TITLE	ASSEMBLY FOR 6 PANEL PUMPING STRUCTURE		
DATE			
DWG NO.	1		
DESIGNED BY	AUTO	DESIGNED BY	CHANDU BHATTAR
REV NO.	0	SHEET NO.	1
CHECKED BY	C.A.		
APPROVED BY	APPROVED BY		

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TOP
VIEW

6 PANEL

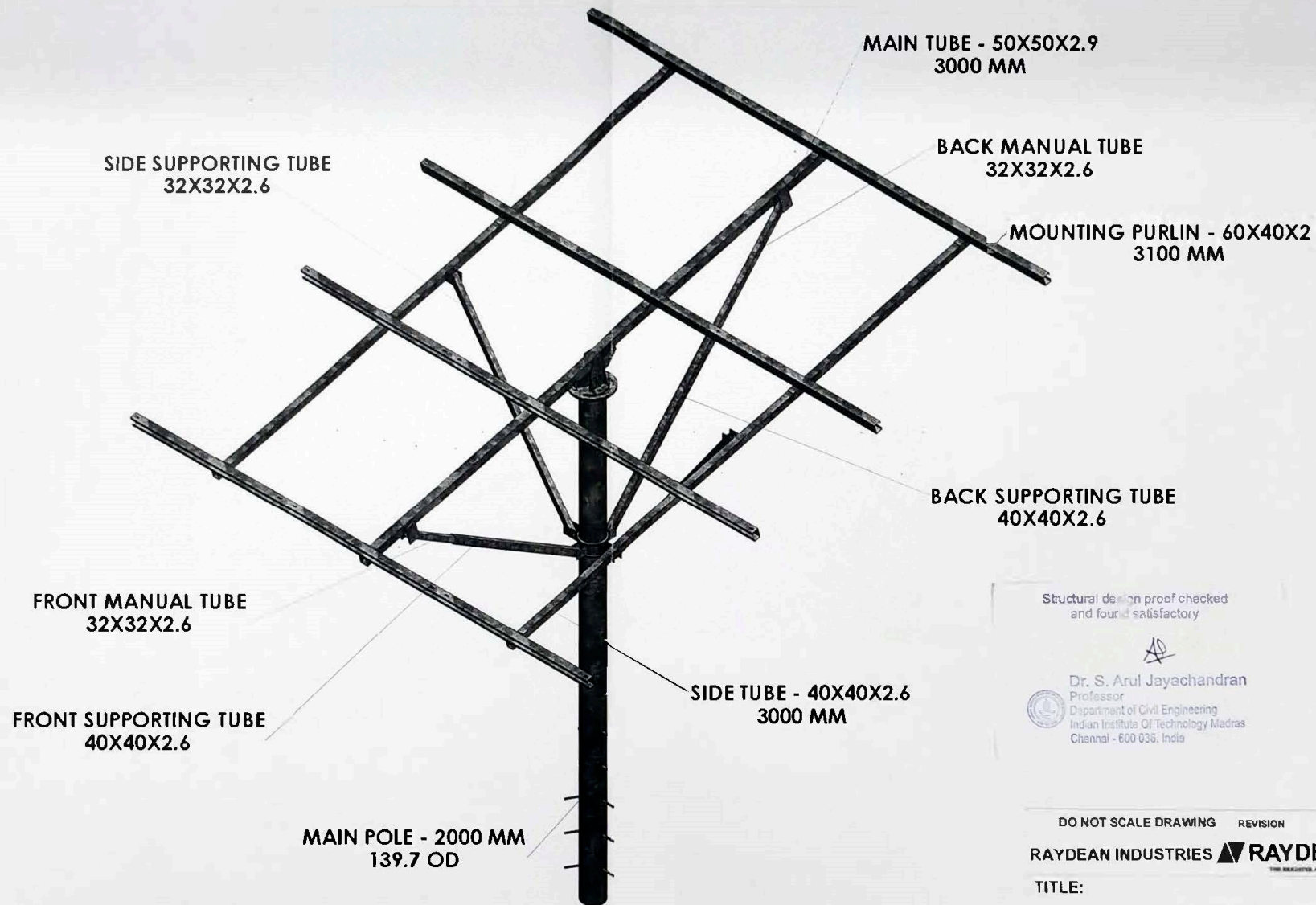
Structural design proof checked
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RAYDEAN INDUSTRIES, JAIPUR		
CLIENT NAME	VTECH SUNSYSTEMS PVT. LTD.	
TITLE	ASSEMBLY FOR 6 PANEL PUMPING STRUCTURE	
DATE		
DWG NO.	1	
DESIGN BY	RAJ	CHECKED BY A.K.A.
REV NO.	0	SHEET NO. 1
	13	14
	15	16



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Indian Institute Of Technology Madras
Chennai - 600 036, India

DO NOT SCALE DRAWING REVISION

RAYDEAN INDUSTRIES **RAYDEAN**
THE WEIGHTED ANGLE OF LIFE

TITLE:

6MMS ASSEMBLY

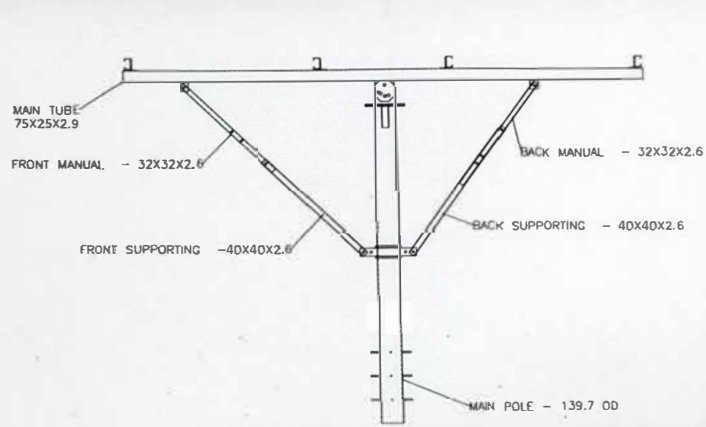
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CHKD				
APPVD				
				WEIGHT:-

DWG NO. ASSEMBLY - 6 MMS

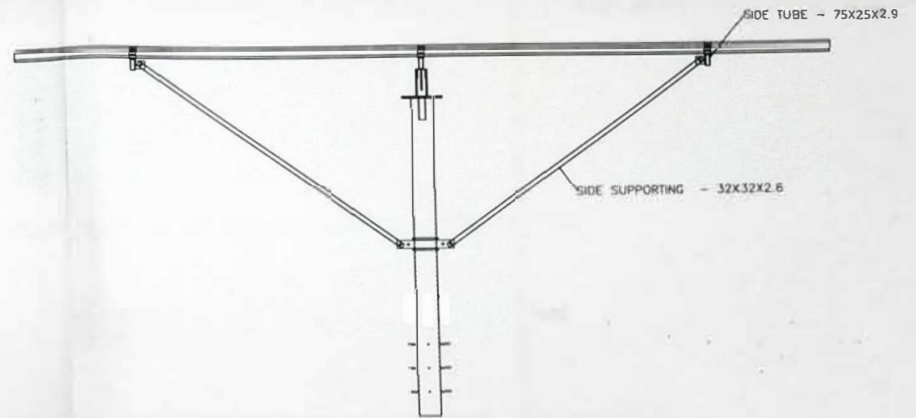
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SHEET 1 OF 2

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SIDE VIEW



FRONT VIEW

9 PANEL

Structural design proof checked and found satisfactory

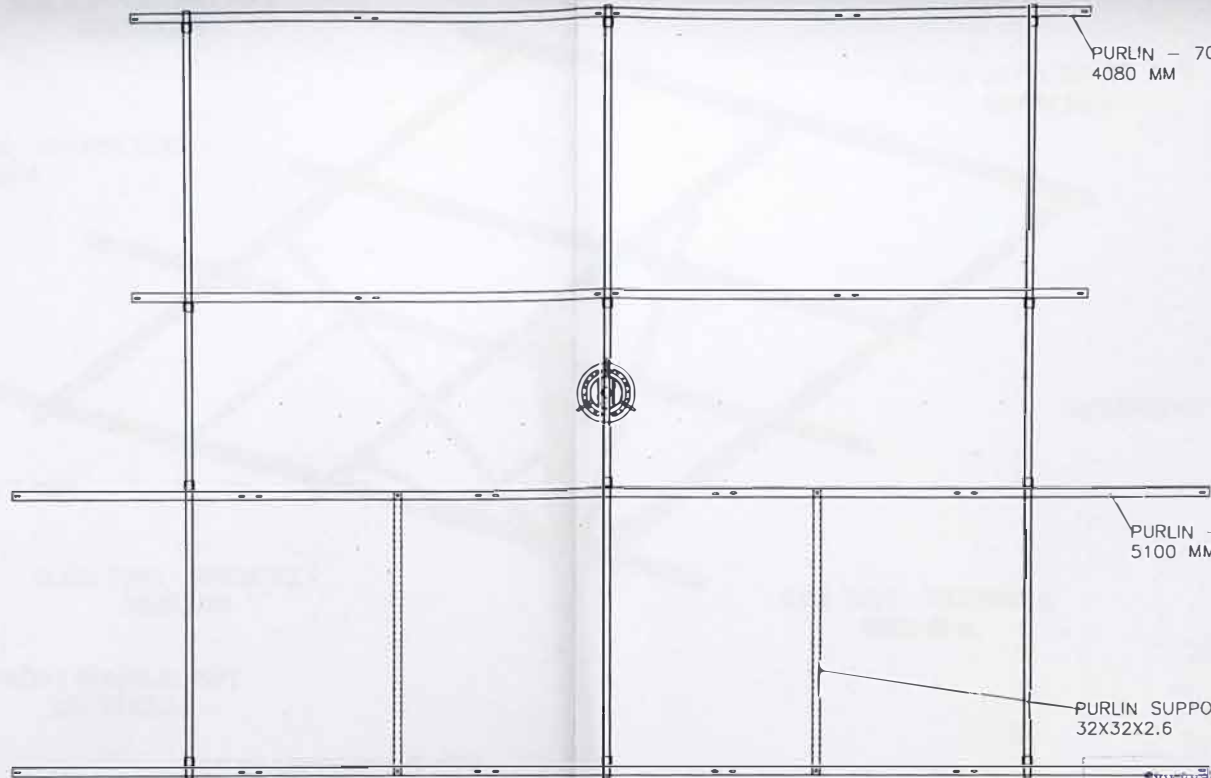
AE



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Chennai - 600 036, India

RAYDEAN INDUSTRIES, JAIPUR		RAYDEAN	
CLIENT NAME	VTECH SUNSYSTEMS PVT. LTD.		
TITLE	VIEWS FOR 9 MMS		
DATE			
DWG NO.	000	CHECKED BY C.B.	
DRAWN BY	ALTO	DESIGNED BY	SHANMUKH
REV NO.	0	SHEET NO.	1
13		14	15
16			

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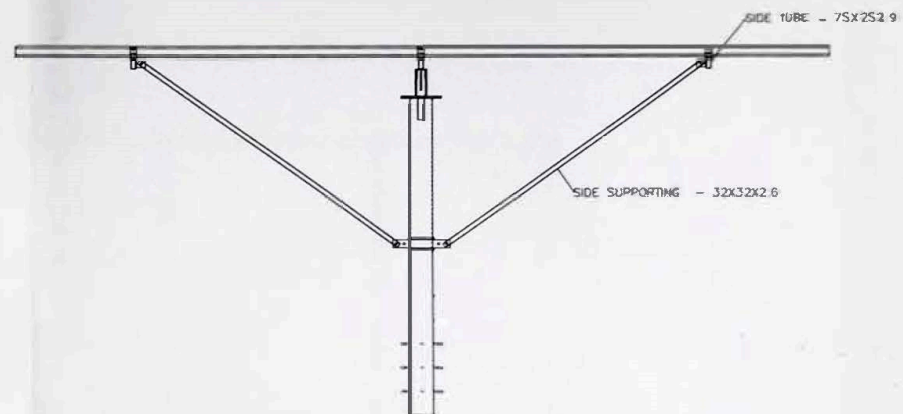
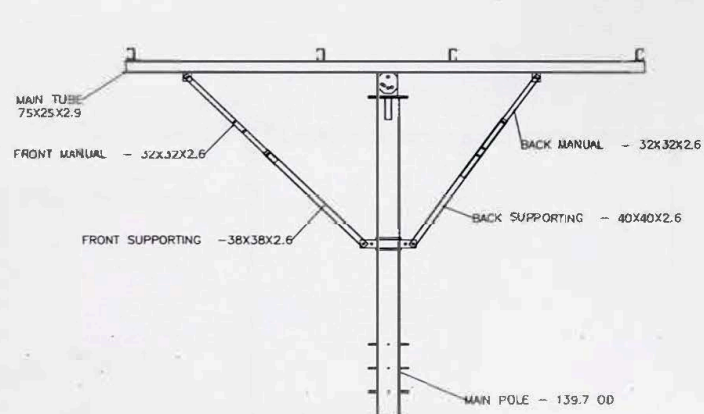
TOP VIEW

9 PANEL

Dr. S. Arul Jayachandran
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Indian Institute of Technology Madras

RAYDEAN INDUSTRIES, JAIPUR			
CLIENT NAME	VTECH SUNSYSYMS PVT. LTD.		
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DATE			
DWG NO.			
DRAWN BY	AUTO	DESIGNED BY	GOVIND BHATTAR
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		APPROVED BY	A.K.D.

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10 PANEL

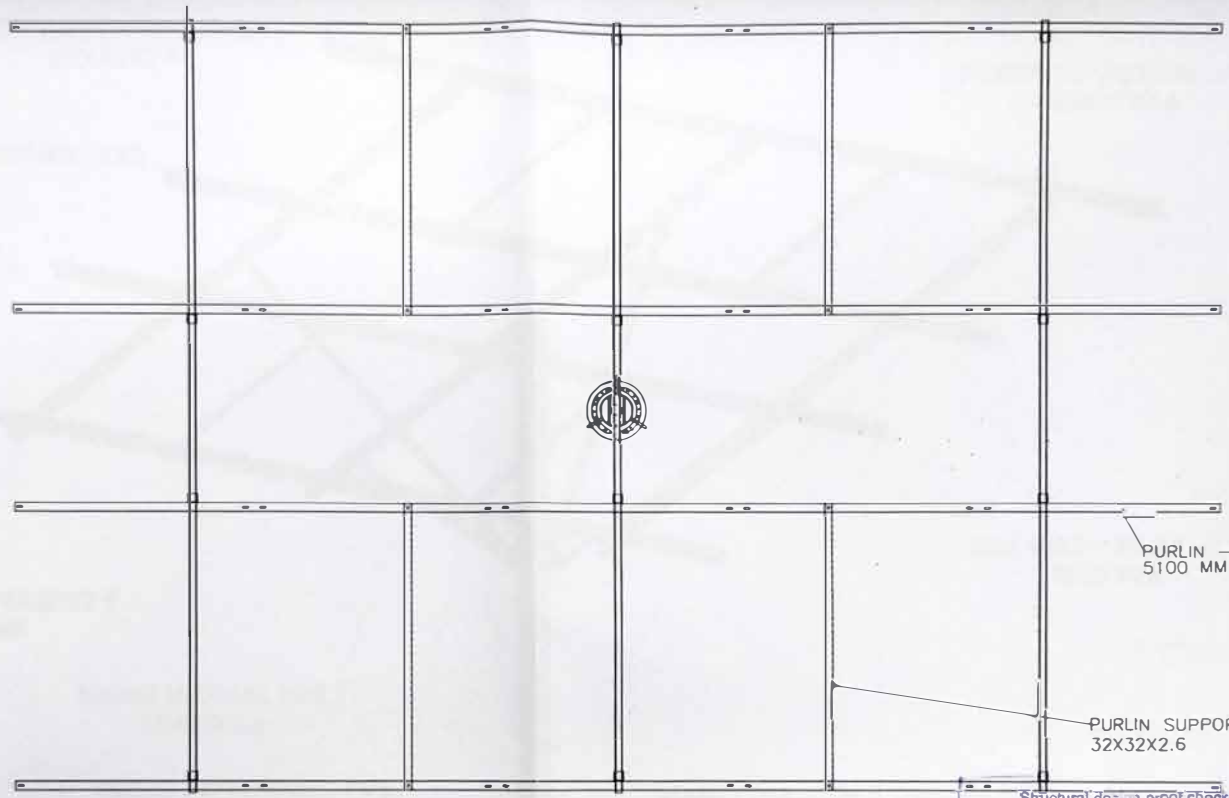
Structural design proof checked
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AS

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RAYDEAN INDUSTRIES, JAIPUR		
CLIENT NAME	VTECH SUNSYS PVT. LTD.	
TITLE	VIEWS FOR 10 MMS	
DATE		
DWG NO.	000	
DESIGNED BY	ADG DESIGNED BY: ADG	CHECKED BY: C.B.
REV NO.	1	SHEET NO. 1
		APPROVED: P.K.A.

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PURLIN — 70X40X2
5100 MM

PURLIN SUPPORTING PIPE
32X32X2.6

Structural design proof checked
and found satisfactory

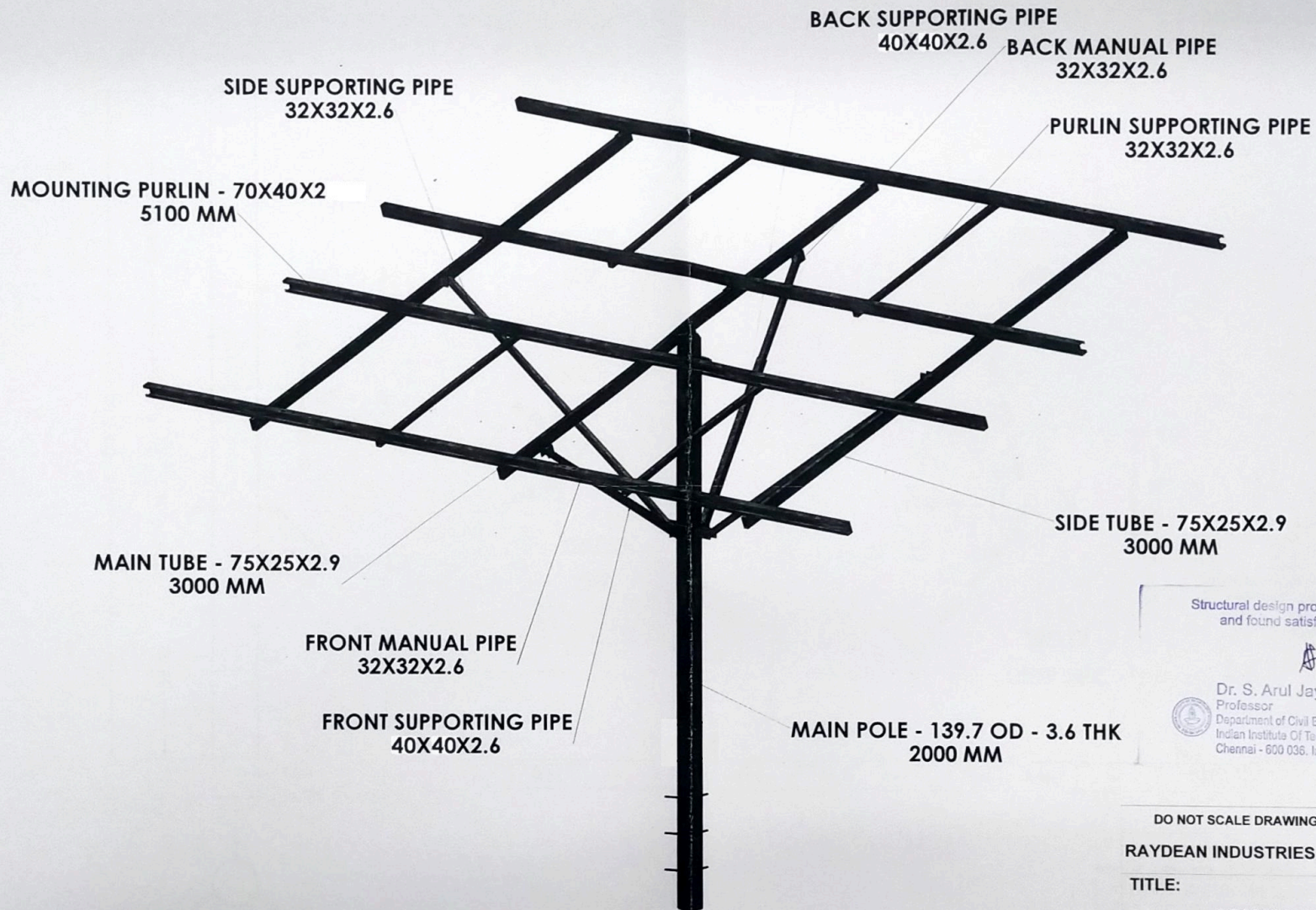
AS

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RAYDEAN INDUSTRIES, JAIPUR 

CLIENT NAME	VTECH SUNSYTEMS PVT. LTD.
TITLE	VIEWS FOR 10 MMS
DATE	
DWG NO.	1
DRAWN BY	AUT0
DESIGNED BY	GOVIND BHATTAR
CHECKED BY	G.S.
REV NO.	0
SHEET NO.	1
APPROVED BY	A.C.D.

10 PANEL



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and found satisfactory

[Signature]



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Chennai - 600 036, India

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TITLE:

10MMS ASSEMBLY

NAME	SIGNATURE	DATE	MATERIAL:	DWG NO.	ASSEMBLY - 10 MMS-1
DRAWN					
CHK'D					
APPVD			WEIGHT:-	SCALE:1:20	SHEET 2 OF 2



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CONNECTED User: Samarth Dakshini

Job No	Sheet No 1	Rev
Part		
Ref		
By	Date: 14-Aug-19	Chd
File	6P FOR BIS - 41KMPH.s	Date/Time 16-Dec-2021 14:58

Job Title

Client

Job Information

	Engineer	Checked	Approved
Name:			
Date:	14-Aug-19		

Project ID	
Project Name	

Structure Type	SPACE FRAME
----------------	-------------

Number of Nodes	35	Highest Node	103
Number of Elements	44	Highest Beam	171

Number of Basic Load Cases	3
Number of Combination Load Cases	2

Included in this printout are data for:

All	The Whole Structure
-----	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DL
Primary	2	WL UP
Primary	3	WL DW
Combination	4	1.0(DL+WL UP)
Combination	5	1.0(DL+WL DW)

Nodes

Node	X (m)	Y (m)	Z (m)
45	3.275	2.178	2.075
47	2.085	1.859	2.075
49	1.215	1.626	2.075
51	0.025	1.307	2.075
56	0	1.300	2.635
57	3.300	2.185	2.635
58	3.275	2.178	2.635
60	2.085	1.859	2.635
61	1.650	1.742	2.635
62	1.215	1.626	2.635
64	0.025	1.307	2.635
68	1.650	0	3.624
69	0	1.300	3.624
70	3.300	2.185	3.624
71	3.275	2.178	3.624
72	2.930	2.086	3.624
73	2.085	1.859	3.624
74	1.650	1.742	3.624
75	1.215	1.626	3.624

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Indian Institute Of Technology Madras
Chennai - 600 036, India



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CONNECTED User: Samarth Dakshini

Job No

Sheet No

73

Rev

Job Title

Part

Ref

By

Date 14-Aug-19

Chd

Client

File 6P FOR BIS - 41KMPH.s

Date/Time 16-Dec-2021 14:58

Failed Members

There is no data of this type.

Base Pressure Summary

	Node	L/C	FX (psi)	FY (psi)	FZ (psi)
Max FX	68	1:DL	0	0	0
Min FX	68	1:DL	0	0	0
Max FY	68	1:DL	0	0	0
Min FY	68	1:DL	0	0	0
Max FZ	68	1:DL	0	0	0
Min FZ	68	1:DL	0	0	0

Statics Check Results

L/C		FX (kN)	FY (kN)	FZ (kN)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
1:DL	Loads	0.000	-2.546	0	81.672	0.000	-37.260
1:DL	Reactions	-0.000	2.546	0.000	-81.672	-0.000	37.260
	Difference	0.000	0.000	0.000	-0.000	0.000	-0.000
2:WL UP	Loads	-4.734	8.204	0	-263.128	-151.835	194.861
2:WL UP	Reactions	4.734	-8.204	-0.000	263.128	151.835	-194.861
	Difference	-0.000	0.000	-0.000	-0.000	-0.000	0.000
3:WL DW	Loads	3.160	-5.465	0	175.286	101.356	-129.912
3:WL DW	Reactions	-3.160	5.465	0.000	-175.286	-101.356	129.912
	Difference	0.000	-0.000	0.000	0.000	0.000	-0.000

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AP



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Chennai - 600 036, India


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*****
*
*      STAAD.Pro CONNECT Edition
*      Version 22.06.00.138
*      Proprietary Program of
*      Bentley Systems, Inc.
*      Date= DEC 21, 2021
*      Time= 15:35:47
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*      Licensed to: Raydean Industries
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2. START JOB INFORMATION
3. ENGINEER DATE 14-AUG-19
4. END JOB INFORMATION
5. INPUT WIDTH 79
6. UNIT METER KN
7. JOINT COORDINATES
8. 45 3.275 2.1783 2.075; 47 2.085 1.85916 2.075; 49 1.215 1.62584 2.075
9. 51 0.025 1.3067 2.075; 56 0 1.3 2.635; 57 3.3 2.185 2.635
10. 58 3.275 2.1783 2.635; 60 2.085 1.85916 2.635; 61 1.65 1.7425 2.635
11. 62 1.215 1.62584 2.635; 64 0.025 1.3067 2.635; 68 1.65 0 3.624; 69 0 1.3 3.624
12. 70 3.3 2.185 3.624; 71 3.275 2.1783 3.624; 72 2.93 2.08577 3.624
13. 73 2.085 1.85916 3.624; 74 1.65 1.7425 3.624; 75 1.215 1.62584 3.624
14. 76 0.37 1.39923 3.624; 77 0.025 1.3067 3.624; 78 1.65 0.29 3.624
15. 79 2.52064 1.51147 3.624; 80 0.818709 1.01038 3.624; 82 0 1.3 4.613
16. 83 3.3 2.185 4.613; 84 3.275 2.1783 4.613; 86 2.085 1.85916 4.613
17. 87 1.65 1.7425 4.613; 88 1.215 1.62584 4.613; 90 0.025 1.3067 4.613
18. 97 3.275 2.1783 5.173; 99 2.085 1.85916 5.173; 101 1.215 1.62584 5.173
19. 103 0.025 1.3067 5.173
20. MEMBER INCIDENCES
21. 77 45 58; 79 47 60; 81 49 62; 83 51 64; 87 56 64; 89 58 57; 103 58 71
22. 105 60 73; 107 62 75; 109 64 77; 113 69 77; 114 68 78; 115 71 70; 116 72 71
23. 117 73 72; 118 74 73; 119 75 74; 120 76 75; 121 77 76; 122 78 74; 123 76 80
24. 124 78 79; 125 79 72; 126 80 78; 129 71 84; 131 73 86; 133 75 88; 135 77 90
25. 139 82 90; 141 84 83; 155 84 97; 157 86 99; 159 88 101; 161 90 103; 162 61 78
26. 163 87 78; 164 64 62; 165 62 61; 166 61 60; 167 60 58; 168 90 88; 169 88 87
27. 170 87 86; 171 86 84
28. DEFINE MATERIAL START
29. ISOTROPIC STEEL
30. E 2.05E+08
31. POISSON 0.3
32. DENSITY 76.8195
33. ALPHA 1.2E-05
34. DAMP 0.03
35. TYPE STEEL
36. STRENGTH FY 253200 FU 407800 RY 1.5 RT 1.2
37. END DEFINE MATERIAL
38. MEMBER PROPERTY INDIAN

```

Structural design proof checked
and found satisfactory

AP



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Professor
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Indian Institute Of Technology Madras
Chennai - 600 036, India

STAAD SPACE


-- PAGE NO. 23

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*****
*   For technical assistance on STAAD.Pro, please visit   *
*   http://www.bentley.com/en/support/                   *
*   *                                                     *
*   Details about additional assistance from               *
*   Bentley and Partners can be found at program menu    *
*   Help->Technical Support                               *
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Chennai - 600 036, India

 Software licensed to	Job No	Sheet No 1	Rev
	Part		
Job Title	Ref		
Client	By	Date 09-Jun-20	Chd
	File 9 MMS RST5_140 15D 2	Date/Time 11-Jan-2022 14:50	

Job Information

	Engineer	Checked	Approved
Name:			
Date:	09-Jun-20		

Structure Type	SPACE FRAME
----------------	-------------

Number of Nodes	37	Highest Node	53
Number of Elements	48	Highest Beam	69

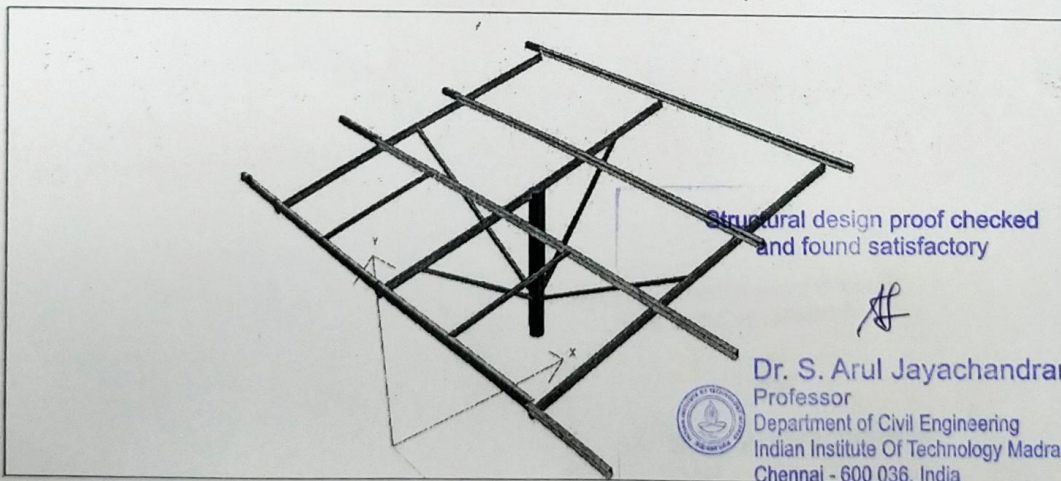
Number of Basic Load Cases	3
Number of Combination Load Cases	5

Included in this printout are data for:


All	The Whole Structure
-----	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD LOAD
Primary	2	WIND UPWARD
Primary	3	WIND DOWNWARD
Combination	4	COMBINATION LOAD CASE 4
Combination	5	COMBINATION LOAD CASE 5
Combination	6	0.6DL+1.0 WL UP
Combination	7	0.6 DL+1.0 WLDN
Combination	100	SUPPORT REACTION



3D Rendered View (Input data was modified after picture taken)

 Software licensed to	Job No	Sheet No 85	Rev
	Part		
Job Title	Ref		
	By	Date 09-Jun-20	Chd
Client	File 9 MMS RST5_140 15D 2	Date/Time 11-Jan-2022 14:50	

Failed Members

There is no data of this type.

Statics Check Results

L/C		FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)
1:DEAD LOAD	Loads	-0.000	-3.235	0.000	0.000	-0.000	-4.768
1:DEAD LOAD	Reactions	0.000	3.235	0.000	0.000	0.000	4.768
	Difference	0.000	0.000	0.000	0.000	-0.000	0.000
2:WIND UPWARD	Loads	-4.535	16.983	0.000	0.000	-0.000	34.145
2:WIND UPWARD	Reactions	4.535	-16.983	-0.000	-0.000	0.000	-34.145
	Difference	0.000	0.000	-0.000	-0.000	0.000	-0.000
3:WIND DOWNWARD	Loads	2.258	-8.501	0.000	-0.000	0.000	-17.067
3:WIND DOWNWARD	Reactions	-2.258	8.501	0.000	0.000	-0.000	17.067
	Difference	-0.000	-0.000	0.000	0.000	-0.000	0.000

Structural design proof checked
and found satisfactory



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Indian Institute Of Technology Madras
Chennai - 600 036, India




```

*****
*
*      STAAD.Pro V8i SELECTseries4
*      Version  20.07.09.31
*      Proprietary Program of
*      Bentley Systems, Inc.
*      Date=    JAN 11, 2022
*      Time=    14:50: 8
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*      USER ID:
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1. STAAD SPACE
INPUT FILE: 9 MMS RST5_140 15D 2 1L corrected.STD
2. START JOB INFORMATION
3. ENGINEER DATE 09-JUN-20
4. END JOB INFORMATION
5. INPUT WIDTH 79
6. UNIT METER KN
7. JOINT COORDINATES
8. 3 0 1.56 0; 4 3.13 2.4 0; 5 1.565 1.98 0; 6 0.368945 1.65901 0
9. 7 2.53082 2.2392 0; 8 1.565 0.834 0; 9 1.565 0.864 0; 10 0 1.56 1.8
10. 11 3.13 2.4 1.8; 12 1.565 1.98 1.8; 15 0 1.56 -1.8; 16 3.13 2.4 -1.8
11. 17 1.565 1.98 -1.8; 20 1.13581 1.86482 0; 21 1.13581 1.86482 1.8
12. 22 1.13581 1.86482 -1.8; 23 2.05371 2.11115 0; 24 2.05371 2.11115 1.8
13. 25 2.05371 2.11115 -1.8; 26 0 1.56 -2.55; 31 1.13581 1.86482 -2.55
14. 33 0 1.56 2.55; 38 1.13581 1.86482 2.55; 40 0 1.56 0.9
15. 41 1.13581 1.86482 -0.9; 42 3.13 2.4 -0.9; 43 2.05371 2.11115 -0.9
16. 44 0 1.56 -0.9; 45 1.13581 1.86482 0.9; 46 3.13 2.4 0.9
17. 47 2.05371 2.11115 0.9; 48 0.966972 1.26151 0; 49 2.04791 1.5516 0
18. 50 3.13 2.4 -2.04; 51 2.05371 2.11115 -2.04; 52 3.13 2.4 2.04
19. 53 2.05371 2.11115 2.04
20. MEMBER INCIDENCES
21. 4 3 6; 5 5 23; 6 6 20; 7 7 4; 8 5 9; 9 9 8; 10 6 48; 11 7 49; 12 10 21
22. 13 12 24; 15 11 24; 16 15 22; 17 17 25; 19 16 25; 20 10 40; 21 20 5; 22 21 12
23. 23 22 17; 24 23 7; 27 22 41; 28 16 42; 29 25 43; 30 15 26; 31 16 50; 35 22 31
24. 36 25 51; 43 10 33; 44 11 52; 48 21 38; 49 24 53; 50 3 44; 51 20 45; 52 4 46
25. 53 23 47; 54 40 3; 55 41 20; 56 42 4; 57 43 23; 58 44 15; 59 45 21; 60 46 11
26. 61 47 24; 62 44 41; 65 40 45; 66 17 9; 67 9 12; 68 48 9; 69 49 9
27. DEFINE MATERIAL START
28. ISOTROPIC STEEL
29. E 2.05E+008
30. POISSON 0.3
31. DENSITY 76.8195
32. ALPHA 1.2E-005
33. DAMP 0.03
34. TYPE STEEL
35. STRENGTH FY 253200 FU 407800 RY 1.5 RT 1.2
36. END DEFINE MATERIAL
37. MEMBER PROPERTY INDIAN
38. 4 TO 7 12 13 15 TO 17 19 21 TO 24 TABLE ST TUB70302.9

```

Structural design proof checked
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***** END OF THE STAAD.Pro RUN *****

**** DATE= JAN 11,2022 TIME= 14:50:17 ****

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* *

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* *

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Chennai - 600 036, India



Software licensed to

Job No

Sheet No

1

Rev

Job Title

Part

Ref

By

Date 09-Jun-20

Chd

Client

File 10 MMS RST5_140 15D

Date/Time 11-Jan-2022 14:54

Job Information

	Engineer	Checked	Approved
Name:			
Date:	09-Jun-20		

Structure Type SPACE FRAME

Number of Nodes	37	Highest Node	49
Number of Elements	50	Highest Beam	69

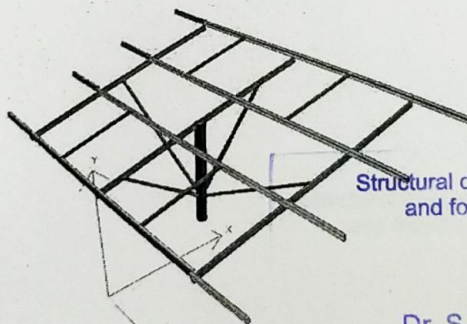
Number of Basic Load Cases	3
Number of Combination Load Cases	5

Included in this printout are data for:

All	The Whole Structure
-----	---------------------

Included in this printout are results for load cases:


Type	L/C	Name
Primary	1	DEAD LOAD
Primary	2	WIND UPWARD
Primary	3	WIND DOWNWARD
Combination	4	COMBINATION LOAD CASE 4
Combination	5	COMBINATION LOAD CASE 5
Combination	6	0.6DL+1.0 WL UP
Combination	7	0.6 DL+1.0 WLDN
Combination	100	SUPPORT REACTION

Structural design proof checked
and found satisfactory

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3D Rendered View (Input data was modified after picture taken)

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	Part		
	Ref		
	By	Date 09-Jun-20	Chd
Client	File 10 MMS RST5_140 15D	Date/Time 11-Jan-2022 14:54	

Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (cm ²)	Iz (cm ⁴)	Iy (cm ⁴)	Ix (cm ⁴)
69	TUB38382.6	TUB38382.6	0.327	1.000	0.327	Slenderness	5	3.510	7.140	7.140	11.900

Failed Members

There is no data of this type.

Statics Check Results

L/C		FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)
1:DEAD LOAD	Loads	-0.000	-3.561	0.000	-0.000	-0.000	-5.611
1:DEAD LOAD	Reactions	0.000	3.561	0.000	0.000	0.000	5.611
	Difference	0.000	-0.000	0.000	0.000	0.000	0.000
2:WIND UPWARD	Loads	-5.039	18.870	0.000	-0.000	-0.000	40.212
2:WIND UPWARD	Reactions	5.039	-18.870	-0.000	0.000	0.000	-40.212
	Difference	0.000	0.000	-0.000	0.000	-0.000	-0.000
3:WIND DOWNWARD	Loads	2.509	-9.445	0.000	-0.000	0.000	-20.101
3:WIND DOWNWARD	Reactions	-2.509	9.445	0.000	0.000	-0.000	20.101
	Difference	-0.000	-0.000	0.000	-0.000	0.000	0.000

Structural design proof checked
and found satisfactory




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*
*      STAAD.Pro V8i SELECTseries4
*      Version 20.07.09.31
*      Proprietary Program of
*      Bentley Systems, Inc.
*      Date=   JAN 11, 2022
*      Time=   14:54:25
*
*      USER ID:
*****

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1. STAAD SPACE
INPUT FILE: 10 MMS RST5_140 15D corrected.STD
2. START JOB INFORMATION
3. ENGINEER DATE 09-JUN-20
4. END JOB INFORMATION
5. INPUT WIDTH 79
6. UNIT METER KN
7. JOINT COORDINATES
8. 3 0 1.56 0; 4 3.13 2.4 0; 5 1.565 1.98 0; 6 0.368945 1.65901 0
9. 7 2.53082 2.2392 0; 8 1.565 0.834 0; 9 1.565 0.864 0; 10 0 1.56 1.8
10. 11 3.13 2.4 1.8; 12 1.565 1.98 1.8; 15 0 1.56 -1.8; 16 3.13 2.4 -1.8
11. 17 1.565 1.98 -1.8; 20 1.13581 1.86482 0; 21 1.13581 1.86482 1.8
12. 22 1.13581 1.86482 -1.8; 23 2.05371 2.11115 0; 24 2.05371 2.11115 1.8
13. 25 2.05371 2.11115 -1.8; 26 0 1.56 -2.55; 27 3.13 2.4 -2.55
14. 31 1.13581 1.86482 -2.55; 32 2.05371 2.11115 -2.55; 33 0 1.56 2.55
15. 34 3.13 2.4 2.55; 38 1.13581 1.86482 2.55; 39 2.05371 2.11115 2.55
16. 40 0 1.56 0.9; 41 1.13581 1.86482 -0.9; 42 3.13 2.4 -0.9
17. 43 2.05371 2.11115 -0.9; 44 0 1.56 -0.9; 45 1.13581 1.86482 0.9
18. 46 3.13 2.4 0.9; 47 2.05371 2.11115 0.9; 48 0.966972 1.26151 0
19. 49 2.04791 1.5516 0
20. MEMBER INCIDENCES
21. 4 3 6; 5 5 23; 6 6 20; 7 7 4; 8 5 9; 9 9 8; 10 6 48; 11 7 49; 12 10 21
22. 13 12 24; 15 11 24; 16 15 22; 17 17 25; 19 16 25; 20 10 40; 21 20 5; 22 21 12
23. 23 22 17; 24 23 7; 27 22 41; 28 16 42; 29 25 43; 30 15 26; 31 16 27; 35 22 31
24. 36 25 32; 43 10 33; 44 11 34; 48 21 38; 49 24 39; 50 3 44; 51 20 45; 52 4 46
25. 53 23 47; 54 40 3; 55 41 20; 56 42 4; 57 43 23; 58 44 15; 59 45 21; 60 46 11
26. 61 47 24; 62 44 41; 63 43 42; 64 47 46; 65 40 45; 66 17 9; 67 9 12; 68 48 9
27. 69 49 9
28. DEFINE MATERIAL START
29. ISOTROPIC STEEL
30. E 2.05E+008
31. POISSON 0.3
32. DENSITY 76.8195
33. ALPHA 1.2E-005
34. DAMP 0.03
35. TYPE STEEL
36. STRENGTH FY 253200 FU 407800 RY 1.5 RT 1.2
37. END DEFINE MATERIAL
38. MEMBER PROPERTY INDIAN

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Structural design proof checked
and found satisfactory

AP



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***** END OF THE STAAD.Pro RUN *****

**** DATE= JAN 11,2022 TIME= 14:54:33 ****

* For questions on STAAD.Pro, please contact *

* Bentley Systems or Partner offices *

* *

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* *

Structural design proof checked
and found satisfactory




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18-03-2022

Certificate of Structural adequacy of MMS

This is to certify that the MMS structure drawing 6mms/9mms/10mms submitted by RAYDEAN INDUSTRIES, JAIPUR is evaluated by me and it is found that the MMS structure structurally superior as specified in the Specification of Solar Water Pumping System notified by the Ministry of New and Renewable Energy (MNRE) vide F.No EESL/06/2020-21/KUSUM/SWPS/1-10 HP/Off Grid/202101032).

The following are the main changes when compared to the MNRE's MMS suggestive design: -

S.No.	According to the MNRE MMS (which is available only in anchor fastener design)	According to the vendor MMS, (which is considering Piling design for greater stability and reliability even in sandy/soft soils)
1	3HP- Combination of 4 MMS and 6 MMS for 3HP (2 Nos MMS and 2 Foundations)	3HP- 8MMS OR 9 MMS or 10MMS Structure, Single MMS and Single Foundation.
2	5HP- Combination of 8 MMS and 8 MMS for 5HP	5HP- Combination of 9 MMS and 6 MMS for 5HP or Combination of 10 MMS and 6 MMS for 5HP
3	7.5 HP - Combination of 3 Nos of 8 MMS for 7.5HP (3 Nos MMS and 3Foundations)	7.5 HP - Combination of 2 Nos of 10 MMS for 7.5HP (2 Nos MMS and 2 Foundations)
4	10 HP - Combination of 4 Nos of 8 MMS for 7.5HP (4 Nos MMS and 4 Foundations)	10 HP - Combination of 2 Nos of 9 MMS and 1 No of 10 MMS for 10 HP (3 Nos MMS and 3 Foundations) or 3 nos. of 10MMS
5	FOUNDATION TYPE in 4/6/8MMS	Foundation type in 6/8/9/10MMS Pilling



In addition to these dimensional enhancements, following improvements have been observed in the MMS design submitted by the vendor over the MNRE's MMS suggestive design: -

1. Use of all parts as per BIS standards - MNRE design has several parts as per attached table which are not as per IS 1161 whereas all the members used in the alternate design are as per IS 1161.
2. Lower Shadow free area occupied by the structure – 3 HP/7.5 HP and 10HP - As per MNRE design 2 structures are required in 3 HP covering an area of 34 sq m with 02 foundations and in ALTERNATE design, a single structure is required resulting in 30% higher land use efficiency for 3 HP pumps. Same is applicable to 7.5 HP pumps (as per MNRE 3 MMS and 3 foundation, where as improved design has 2 MMS and 2 Foundations.) and 10 HP pump(as per MNRE 4 MMS and 4 foundation, where as improved design has 3 MMS and 3 Foundations. This would result in lower utilization of precious farm land.
3. Greater Foundation suitability for sandy soils and guaranteed higher quality foundation and structure stability on site – Compared to the anchor fastener/ J bolt design of the MNRE structures, the proposed direct Piling design is more suitable for use in multiple locations including soft and sandy soils having density lower than 1.73 g/cm³. This type of direct piling design also provide high uplift resistance to Wind loads due to greater depth of the main pole. The structure having piling foundation has better alignment than the structure having 4 nos J-BOLT foundation as the vertical alignment can be seen visually very easily at the time of carrying out the installation. There is a lower chance of such a foundation sinking due to the centre pole being embedded for almost 2 metres. In the MNRE suggested anchor fastener or J- Bolt design the foundation structure depends entirely on the very accurate mix of cement and other materials being used on site. Any deviation cannot be detected by any visual check after the foundation is made or during verification of the installation. The direct piling of the alternate design ensures that the factory made. Piling design prevents the users from installing the structures illegally on their roof tops and other unsuitable sites.

Signature of the head

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Structural engineering department