



# CALCULATION OPEN WINCH HOIST

PAGE 1 / 3

5/6/2025

✓

CHECK LIST

✓

OK

✗

NO

|      |          |               |    |          |      |                  |    |                    |        |                      |    |
|------|----------|---------------|----|----------|------|------------------|----|--------------------|--------|----------------------|----|
| D    | 1200     | Diameter Drum | NO | Rail     | A65  | Rail Traversing  | NO | $\sigma_{x-total}$ | 752.5  | Total Stress Trolley | NO |
| call | 457.7194 | Stress Drum   | NO | $\sigma$ | 14.7 | MAX STRESS Joint | Ok | BL                 | 1062.8 | Braking Load         | NO |

COMPANY

pasargad

PROJECT NAME

2012

TAG NAME

cemliwss

REVISION .DC

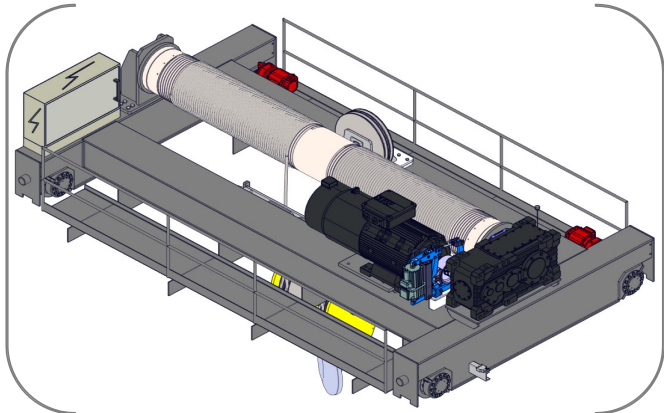
C

IDD CODE

pasargad-2012-cemliwss-C-650000KG-21000MM-M4

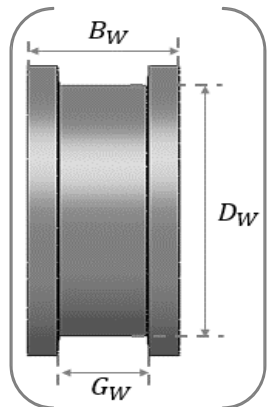
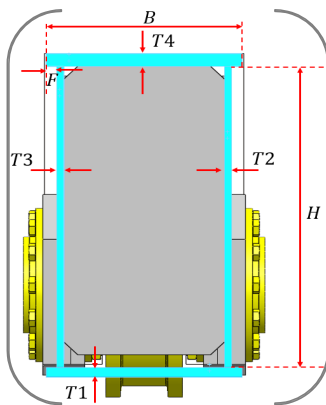
GENERAL HOIST DATA

|          |                |                                            |       |
|----------|----------------|--------------------------------------------|-------|
| Q        | 650000         | Safety Working Load                        | kg    |
| H.O.L    | 21000          | Lift Height                                | mm    |
| WG       | M4             | Working Group                              | ISO   |
|          | _35_X_7        |                                            |       |
| d        | 28             | Rope Diameter                              | mm    |
| D        | 1200           | Drum Diameter                              | mm    |
| $N_m$    | 24/2           | Reeving                                    | ---   |
| $V_h$    | 1              | Lifting speed                              | m/min |
| $L_{sw}$ | 300            | Rope Length between winch and hoist        | mm    |
| $L_{kl}$ | 2              | Required rope length for the clamping      | mm    |
| A        | 5              | The space required to install the coupling | mm    |
| B        | 50             | The space drum and rope clamp              | mm    |
| $\eta_r$ | Roller Bearing | Efficiency of one rope sheave              | ---   |
| M        | ST-52          | Material Drum                              | ---   |
| DF       | 1.15           | Dynamic factor                             | ---   |



TROLLEY DATA

|    |     |                           |    |
|----|-----|---------------------------|----|
| H  | 500 | Height Web                | mm |
| B  | 100 | Width Top & Bottom Flange | mm |
| T1 | 3   | Thickness Bottom Flange   | mm |
| T2 | 16  | Thickness Web 1           | mm |
| T3 | 12  | Thickness Web 2           | mm |
| T4 | 12  | Thickness Top Flange      | mm |
| F  | 6   | Space Flange              | mm |



GENERAL DATA TROLLEY

|    |      |                |    |
|----|------|----------------|----|
| WB | 5000 | Wheel Base     | mm |
| RG | 1800 | Rail Gauge     | mm |
| DW | 500  | Diameter Wheel | mm |
| BW | 80   | Width Wheel    | mm |
| GW | 50   | Groove Wheel   | mm |

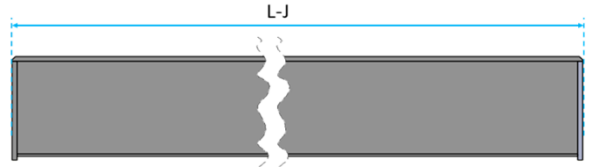
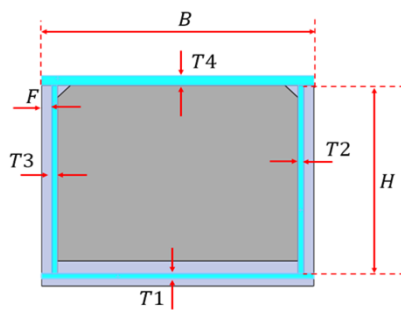


GENERAL DATA TROLLEY

|     |       |                        |       |
|-----|-------|------------------------|-------|
| XC  | 5     | Weld Thickness         | mm    |
| GD  | A1    | Amplifying coefficient | FEM   |
| BS  | 10    | Trolley Speed          | m/min |
| MR  | 44    | Material (Rail )       | ST    |
| SKF | 22213 | Bearing                | SKF   |
| RT  | A65   | Rail Type              | mm    |

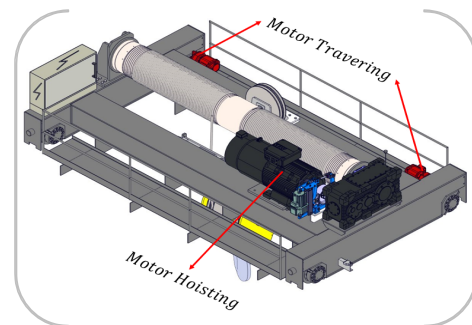
TROLLEY DATA

|     |      |                                       |    |
|-----|------|---------------------------------------|----|
| H   | 500  | Height Web Joint Box                  | mm |
| B   | 200  | Width Bottom and Top Flange Joint Box | mm |
| T1  | 12   | Thickness Bottom Flange Joint Box     | mm |
| T2  | 20   | Thickness Web Joint Box               | mm |
| T3  | 12   | Thickness Web Joint Box               | mm |
| T4  | 15   | Thickness Top Flange Joint Box        | mm |
| F   | 15   | Distance flange Joint Box             | mm |
| L-J | 1591 | Lenght Joint Box                      | mm |



INPUT DATA MOTOR

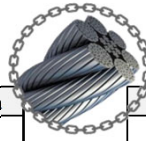
|    |                 |                                          |      |
|----|-----------------|------------------------------------------|------|
| S3 | 0.25            | Operating mode For Traversing            |      |
| S3 | 0.4             | Operating mode For Hoist                 | %    |
| T  | 50              | Ambient temperature                      | °C   |
| H  | 2500            | Installation altitude above sea level    | m    |
| f  | Under Running   | Rolling Friction of Drive                | ---- |
| E  | Sleeve          | Mechanical efficiency Of Drive machinery | ---- |
| TM | AC.Sq.Cage      | Type Of Motor                            | ---- |
| TC | Static Stepless | Type of control                          | ---- |
| RS | 3000            | Speed Range                              | ---- |





## CALCULATE ROPE HOIST

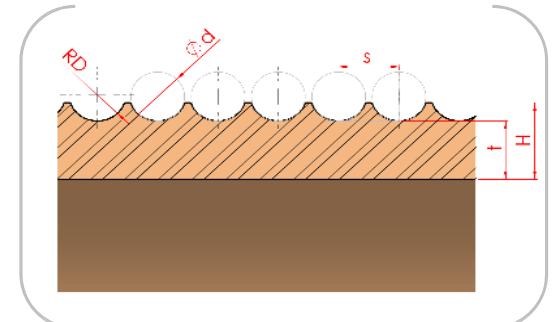
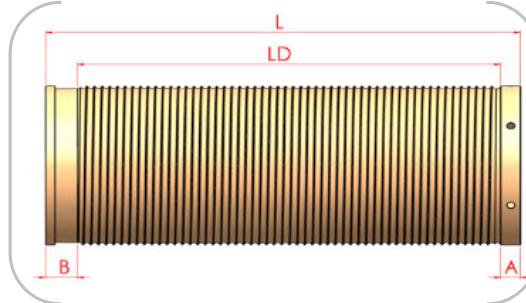
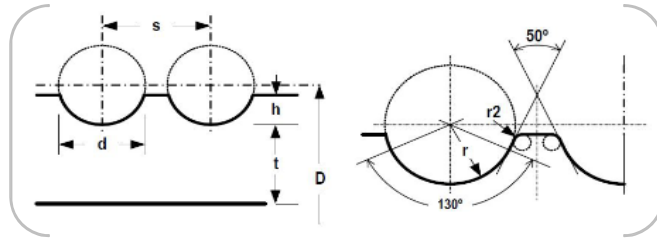
|          |         |                       |       |
|----------|---------|-----------------------|-------|
| $V_s$    | 24.00   | required rope speed   | m/min |
| $\eta_s$ | 0.78    | rope drive efficiency | ----  |
| S        | 56.45   | rope tensile force    | KN    |
| BL       | 1062.75 | Braking Load          | KN    |
| BL       | 556.53  | Wire Rope Tension     | KN    |



|          |       |                               |      |
|----------|-------|-------------------------------|------|
| dd       | 16.00 | Drum coefficient              | ---- |
| $N_r$    | 6.00  | Number of ropes per drum      | ---- |
| SP       | 4.00  | Rope coefficient              | ---  |
| $h_2$    | 18.00 | Sheave coefficient            | ---  |
| $\eta_r$ | 0.98  | Efficiency of one rope sheave | ---  |

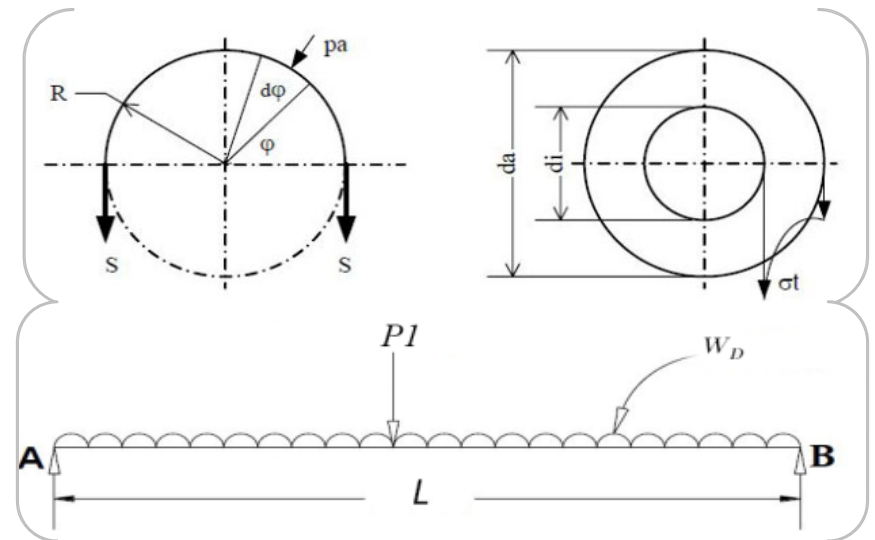


## CALCULATE DRUM HOIST



|     |         |                       |    |
|-----|---------|-----------------------|----|
| s   | 32.20   | Pitch Diameter        | mm |
| Rev | 139.76  | Number of Drum Groove | mm |
| LD  | 4500.21 | Drum Length Groove    | mm |
| L   | 4555.21 | Pitch Diameter        | mm |
| t   | 30.80   |                       | mm |
| H   | 37.80   |                       | mm |
| RD  | 9.80    |                       | mm |

|                |           |                                           |                |
|----------------|-----------|-------------------------------------------|----------------|
| da             | 1180.40   | effective outer drum diameter             | mm             |
| di             | 1118.80   | effective inner drum diameter             | mm             |
| R              | 590.20    | radius of drum                            | mm             |
| pa             | 2.97      | outer pressure                            | Mpa            |
| $\sigma_t$     | 58.44     | stress lies in the inner side of the Drum | Mpa            |
| P1             | 556.53    | Wire Rope Tension                         | KN             |
| $\sigma_c$     | 457.23    | Compressive stress Drum                   | Mpa            |
| AD             | 0.11      | Area Drum                                 | m <sup>2</sup> |
| V              | 0.51      | Volume Drum                               | m <sup>3</sup> |
| WD             | 3950.30   | Weight Drum                               | kg             |
| RA             | 278.26    |                                           | KN             |
| RB             | 278.26    |                                           | KN             |
| BM             | 655840.37 | Max bending moment                        | N.m            |
| I              | 18.38     | Moment of inertia of hollow pipe          | m <sup>4</sup> |
| $\sigma_B$     | 21.06     | Bending Stress                            | Mpa            |
| $\sigma_{all}$ | 457.72    | Combined stress                           | Mpa            |



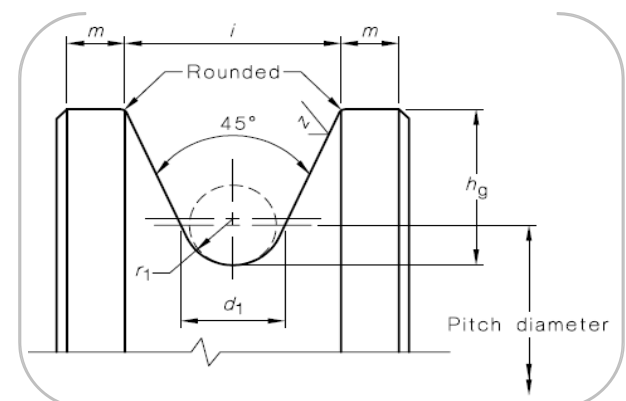
|                |         |                 |    |    |
|----------------|---------|-----------------|----|----|
| YS             | 275.000 | Yield Strength  | mm | NO |
| $\sigma_{all}$ | 457.719 | Combined stress | mm |    |

|    |      |                      |    |    |
|----|------|----------------------|----|----|
| D  | 1200 | Select Diameter Drum | mm | Ok |
| DF | 448  | Min Diameter Drum    | mm |    |



## CALCULATE SHEAVE

|      |        |                          |      |
|------|--------|--------------------------|------|
| DS   | 504.00 | Pitch diameter of sheave | mm   |
| hg   | 27.00  | Sheave Groove depth      | ---- |
| r1   | 15.40  | Groove radii maximum     | mm   |
| r1   | 14.84  | Groove radii Minmum      | mm   |
| N-sh | #N/A   | Number Sheave            | ---  |



## CALCULATE JOINT BOX

|                    |       |       |       |       |       |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point              | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    |
| $\sigma_x$ (total) | 14.71 | 13.21 | 13.21 | 11.96 | 10.52 | 10.52 | 14.71 | 13.21 | 13.21 | 11.96 | 10.52 | 10.52 |

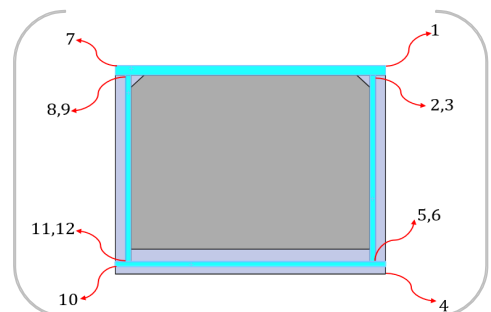
|                   |       |    |      |
|-------------------|-------|----|------|
| $L/J/H < 25$      | 3.182 | OK | CMAA |
| $L/J/B < 65$      | 8.0   | OK | CMAA |
| $1.6 < H/B < 2.7$ | 2.5   | OK | CMAA |
| $b/T4 < 39$       | 9.2   | OK | CMAA |

|                             |             |                 |  |
|-----------------------------|-------------|-----------------|--|
| MOMENT OF INERTIA JOINT BOX |             |                 |  |
| Ix                          | 1008071028  | mm <sup>4</sup> |  |
| Iy                          | 93297333.33 | mm <sup>4</sup> |  |

|          |       |                  |    |
|----------|-------|------------------|----|
| $\sigma$ | 14.71 | MAX STRESS Joint | Ok |
|----------|-------|------------------|----|

|       |         |         |                 |
|-------|---------|---------|-----------------|
| Point | $S_x$   | $S_y$   | UNITE           |
| 1     | 3044887 | 932973  | mm <sup>3</sup> |
| 2     | 3189391 | 1097616 | mm <sup>3</sup> |
| 3     | 3189391 | 1097616 | mm <sup>3</sup> |
| 4     | 5145060 | 932973  | mm <sup>3</sup> |
| 5     | 5480735 | 1097616 | mm <sup>3</sup> |
| 6     | 5480735 | 1097616 | mm <sup>3</sup> |
| 7     | 3044887 | 932973  | mm <sup>3</sup> |
| 8     | 3189391 | 1097616 | mm <sup>3</sup> |
| 9     | 3189391 | 1097616 | mm <sup>3</sup> |
| 10    | 5145060 | 932973  | mm <sup>3</sup> |
| 11    | 5480735 | 1097616 | mm <sup>3</sup> |
| 12    | 5480735 | 1097616 | mm <sup>3</sup> |

ELASTIC SECTION MODULUS





## CALCULATE TROLLEY HOIST

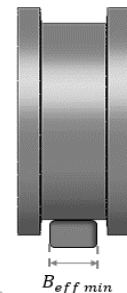
| CALCULATE BEARING WHEEL |          |                                                        |      |
|-------------------------|----------|--------------------------------------------------------|------|
| Parameter               | Value    | Description                                            | Unit |
| RL                      | 472.6753 | RADIAL LOAD IN BEARING                                 | KN   |
| AL                      | 118.1688 | AXIAL LOAD IN BEARING                                  | KN   |
| $P_B$                   | 0.316704 | THE FORCE ACTING ON THE BEARING                        | KN   |
| L_10H                   | 2188.097 | BASIC RATING LIFE (AT 90% RELIABILITY) OPERATING HOURS | hr   |
| CALCULATE STRESS        |          |                                                        |      |
| Fx-Max                  | 825791.1 | MAX FORCE WHEEL LOAD - X                               | N    |
| Fy-Max                  | 8508.155 | MAX FORCE WHEEL LOAD - Y                               | N    |
| fx-min                  | 825791.1 | MIN FORCE WHEEL LOAD - X                               | N    |
| mx-max                  | 2.06E+09 | MAX MOMENT ACTING ON END CARRIAGE                      | N.mm |
| mx-min                  | 2.06E+09 | MIN MOMENT ACTING ON END CARRIAGE                      | N.mm |
| my-max                  | 21270387 | MAX MOMENT ACTING ON END CARRIAGE                      | N.mm |
| $\sigma_x$ -max         | 526.5317 | MAX STRESS -X                                          | mpa  |
| $\sigma_x$ -min         | 5484.603 | MAX STRESS -X                                          | mpa  |
| $\sigma_y$ -max         | 56.50806 | MAX STRESS -Y                                          | mpa  |
| $\sigma_x$              | 583.0397 | MAX STRESS                                             | mpa  |
| s-flange                | 12800000 | FLANGE SECTION STATIC MOMENT                           | mm^3 |
| tw                      | 158.5639 | SHEAR STRESS OF THE WELD                               | mpa  |
| $\sigma_x$ -total       | 752.4746 | TOTAL COMBINED STRESS                                  | mpa  |
| CALCULATE WHEEL LOAD    |          |                                                        |      |
| $P_{Max}$               | 825.7911 | MAX STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE    | KN   |
| $P_{Min}$               | 825.7911 | MIN STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE    | KN   |
| $P_{dyn-Max}$           | 945.3505 | MAX DYNAMIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE   | KN   |
| $P_{dyn-Min}$           | 945.3505 | MIN DYNAMIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE   | KN   |



## SELECTION MOTORS

| Parameter | Description      | Power ( KW ) | Round ( RPM ) |
|-----------|------------------|--------------|---------------|
| DHM       | Hoist Motor      | 121.43       | 7.54          |
| DTLM      | Traversing Motor | #VALUE!      | 6.37          |

| Parameter       | Value   | Description               |
|-----------------|---------|---------------------------|
| S3 - Traversing | 1.30    | Cyclic duration factor    |
| S3 - Hoist      | 1.15    | Cyclic duration factor    |
| f-T             | 0.88    | Temperature factor        |
| F-H             | 0.91    | Sea level factor          |
| f               | Non     | Rolling Friction factor   |
| a               | 0.25    | acc rate traversing       |
| a               | 0.25    | acc rate traveling        |
| Cr- Traversing  | 1.08    | Rotational inertia factor |
| kt              | 1.08    | acc Torque Factor         |
| ks              | 1.30    | acc Torque Factor         |
| E               | 1.00    | Mechanical efficiency     |
| nf              | 0.93    | Free Running              |
| nr              | 3000.00 | Full Load Speed           |



|           |             |    |
|-----------|-------------|----|
| $P_{Max}$ | 825.7911364 | KN |
| RT        | A65         | mm |

| MIN WIDTH RAIL TRAVERSING |        |    |
|---------------------------|--------|----|
| B-RAIL                    | 53     | mm |
| B-EFF                     | 228.98 | mm |

|                |     |    |
|----------------|-----|----|
| SELECTION RAIL | A65 | NO |
|----------------|-----|----|



|            |        |            |    |
|------------|--------|------------|----|
| $\sigma_x$ | 583.04 | MAX STRESS | NO |
|------------|--------|------------|----|

|    |        |                          |    |
|----|--------|--------------------------|----|
| tw | 158.56 | SHEAR STRESS OF THE WELD | NO |
|----|--------|--------------------------|----|

|                   |        |                       |    |
|-------------------|--------|-----------------------|----|
| $\sigma_x$ -total | 752.47 | TOTAL COMBINED STRESS | NO |
|-------------------|--------|-----------------------|----|

