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Analysis of the structures of Belt Conveyors designed in open and closed section laminated profiles

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Abstract. *The tendency of modern structures in general is to provide large open spaces where this implies the use of stronger materials to allow a lightweight, slender and economical structural solution that is able to predict certain behaviors through different demands. In view of these criteria, long-distance belt conveyors employ different belt widths and are used in industrial mining complexes and are sized according to their use. These equipment's consist of mechanical elements and metal structures, the latter being executed as three-dimensional metal lattice structures in which they are designed to withstand different actions. Such designed metal truss structures under general design conditions are sized according to specific criteria of national and international technical standards. Each technical standard follows specific parameters related to the combination of actions and dimensional analysis of structural elements subjected to traction and compression. Analyzing these variables, the main objective of this work will be to dimension metallic structures of long distance conveyors with belt width of 1800 mm, verifying a comparison according to specific criteria of ABNT NBR 8800 (2008), EUROCODE (2010) and AISC technical standards. / LRFD (2010). Subsequently, a parametric optimization will be performed on constituent structural elements subject to static and dynamic actions.*

Keywords: *Conveyor Belts, Metallic Structures, Parametric Optimization*

1. INTRODUCTION

The qualification of the professional to work in the area of structural projects is becoming increasingly demanding as professionals in the field are often faced with events in which structures in industrial environments may find themselves in unforeseen vibratory situations that end up being neglected at the time of sizing.

Under general conditions, to dimension the long-distance belt conveyors, similar to the one shown in Fig. 1, it is necessary to know the iron ore to be transported, the operating speed, the span of the metal structure used to support the mechanical equipment and especially the volume of material transported in the mining complex. This transported volume is associated with the belt width that parameterizes all other geometries of the mechanical equipment to be used.

Figure 1 . Belt conveyor for iron ore – 2019.
Available from: https://www.em.ufop.br/images

After choosing the mechanical components used in the belt conveyor, it will be necessary to choose the structural system and dimension the appropriate constituent elements, which, under general conditions, are three-dimensional flat trusses subjected to stressing tensile and compressive stresses.

Thus, these three-dimensional flat lattice structural systems used as supporting structures in belt conveyors need to be analyzed to withstand the stresses of stress. Such efforts are produced according to combinations prescribed by the technical standards ABNT NBR 8800 (2008), EUROCODE (2010) and AISC / LRFD (2010), meeting their design parameters in each structural element of the supporting structure.

For this, these constituent elements of the flat trusses must be analyzed according to external, static and dynamic actions, together with the calculation method defined by the technical norms used for the purpose of this type of structure, associated to the laminated profile that best characterizes it. the cost and benefit standards for its execution.

With these parameters, the main objective of this work will be to analyze structural systems designed in three-dimensional flat trusses to support metallic structures used in conventional belt conveyors with predefined belt widths when subjected to static and dynamic actions, verifying an adequate parametric optimization.

2. MATERIAL AND METHODS

The conventional long-distance belt conveyors (TCLDs) here are those equipped using flat belts. The geometries and cargo carrying capacities vary greatly between the equipment used and can exceed hundreds of kilometers, depending on the terrain relief and production capacity, which can reach tens of thousands of tons transported per hour.

The supporting metal structures of this equipment, used in large mining complexes, can be designed into bridges or lattice galleries. These support structures are designed for different types of geometries and constructive arrangements. The width of the belt used in lattice bridges is in the range of 400 *mm* to 1800 *mm* and can exceed free spans between 8 *m* and 25 *m*. In the case of latticed galleries, the belt used is in the range of 1800 *mm* to 2200 *mm* and can reach up to 48 *m*.

The mechanical equipment used in this category of structure has specific criteria and produces static and dynamic actions that need to be verified. Such static and dynamic actions introduced in these structures are due to the coupled mechanical equipment, being specific to each structural system.

Static and dynamic category actions, which are applied to the supporting steel structures of long-distance belt conveyors, are generally standardized and quantified using the CEMA (2006) technical standard, the manual (1992) and ISO 1940-1 (1986). The CEMA technical standard (2006) guides all the necessary procedures for the survey of the static and dynamic actions through a description of all the mechanical equipments, along with the presentation of all the technical devices necessary to know and classify these actions. The manual FAÇO (1992) is considered a national tutorial, contrary to the technical standard CEMA (2006) of American origin. The international technical standard ISO 1940-1 (1986) guides the specifications for dynamic actions produced by rotating equipment unbalances in general according to a *G* balance quality rating.

For structural elements used in structural systems in belt conveyors, the main concerns are related to the economy that medium and high mechanical strength structural steels can produce. This category of structural steel meets the requirements of large mining complexes for structures subject to static and dynamic action.

Rolled sections using this steel have standard geometric characteristics to facilitate the marketing of this product. In the case of open section laminated profiles that will be used in this work, they will be obtained through a national manual. For seamless closed section rolled sections, elements will be used through the standardization of a national manual, both used on a large national scale.

For the flat truss structural system to be applied to belt conveyors, it will be necessary to know its behavior when this system is subjected to static and dynamic actions, so that its dimensioning is correct for its purpose and functionality. Thus, it is possible to avoid risks to its stability and integrity by providing safety in its use and economic viability.

The economical viability is possible through the parametric or dimensional optimization used in lattice metallic structure in which the geometry of the constituent elements (cross section and length of the elements) are suitable for the acting forces, therefore, this optimization technique, the geometry of the profiles used. , is changed to optimal points. The lattice structural systems are mainly subjected to axial stress, so that only for this specific criterion, elements subjected to tensile and compressive stress will be presented, following sizing guidelines according to the technical standards ABNT NBR 8800 (2008), AISC / LRFD (2010) and EUROCODE (2001).

The metal structures were analyzed and verified with the aid of modeling in a structural analysis program, where all necessary static and dynamic actions and all verification parameters will be applied according to the technical standards mentioned above. The program used in the structural analysis was CS2000 SAP2000, which adopts computational CAD tools (Computeraided Desing). The program provides bar forces, knot displacements, support reactions and allows us to perform structural element verification by international standards.

The metallic support structures for belt conveyors analyzed were the TR-01 (1800 *mm*) lattice bridge and TR-02 (1800 *mm*) lattice gallery models. Both models were submitted to the same static and dynamic actions and were analyzed according to the technical norms presented in this study. Tables 1 and 2 below show the technical and operational characteristics of the conventional belt conveyors that have been verified..

Table 1 . Technical specifications of belt conveyors analyzed - Part 1.

Belt conveyor	Design Capability *(t/h)*	Belt speed *(m/s)*	Belt Type
TR-01 (1800 *mm*)	9493	3,60	GOOD EP 420
TR-02 (1800 *mm*)	9732	3,73	GOOD EP 320

Table 2 . Technical specifications of belt conveyors analyzed - Part 2

Belt conveyor	Larger range *(mm)*	Power output *(kW)*	Structure type
TR-01 (1800 *mm*)	14820	400	BRIDGE
TR-02 (1800 *mm*)	15000	315	CULVERT

Table 3 below shows the permanent static actions of the iron ore material transported to the overload corresponding to each belt conveyor model according to the run geometry. Table 04 presents the total actions in which such sum of the static actions of each carrier is scored at the end.

Table 3 . Static actions due to mechanical elements

Belt conveyor	Load Rolls *(kgf)*	Base load rollers *(kgf)*	Return rollers *(kgf)*	Return roller base *(kgf)*	Strap (2X) *(kgf)*	Walkway *(kgf)*	Side protection (2X) *(kgf)*	Piping *(kgf)*
TR-01 (1800 *mm*)	140	45	65	40	2x60	2x75	2x80	200
TR-02 (1800 *mm*)	140	45	65	40	2x60	2x75	2x80	200

Table 4 . Actions due to material transported, overload and full load

Belt conveyor	Total Self Weight *(kgf/m)*	Sum due to material (kgf/m) (γ = 2,1 *tf/m³*)	Overload *(kgf/m)* 300/500 *(kgf/m²)*	Ação total *(kgf/m)*
TR-01 (1800 *mm*)	920	1100	800	2820
TR-02 (1800 *mm*)	920	1100	800	2820

For the analysis of wind actions, the parameters used for both models were established according to technical standard ABNT NBR 6123/1988 - Forces Due to The wind in the buildings was considered. Table 5 below shows the values corresponding to each factor and the base value of the dynamic wind pressure considered.

Table 5 . Actions due to wind acting on belt conveyors

Basic wind speed *(m/s)*	Topographic factor (S1)	Roughness factor of the terrain (S2)	Static factor (S3)	Dynamic pressure (q)
32	1,0	1,09	1,09	64 *kg/m²*

For the dynamic action generated, the technical information presented in the FAÇO technical manual (1996) was used to collect the parameters used in the geometry of the load and return rollers considered rigid for the data basis. The ISO 1940-1 (2001) technical standard was used to base the balance quality grade (G) for the load and return rollers in question to analyze the dynamic actions. Both standards were used to establish the values presented in tables 6 and 7.

Table 6 . Technical parameters of unbalanced rollers

Belt conveyor	Load roller set mass (kgf)	Mass of the return roller assembly (kgf)	Conveyor speed (m/s)	Balanced Quality Grade (mm/s)
TR-01 (1800 mm)	140	75	3,60	6,3
TR-02 (1800 mm)	140	75	3,73	6,3

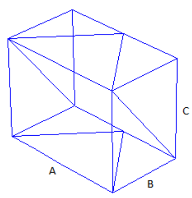
Table 7 below shows the dynamic actions applied to each belt conveyor structural model. The total free force of the unbalanced rollers will represent the incidence of a vertical action acting on the metallic structure being applied on the knots corresponding to the longitudinal axis of the transverse cross section at the top of the mathematical models in question.

Table 7 . Technical Parameters of Dynamic Actions

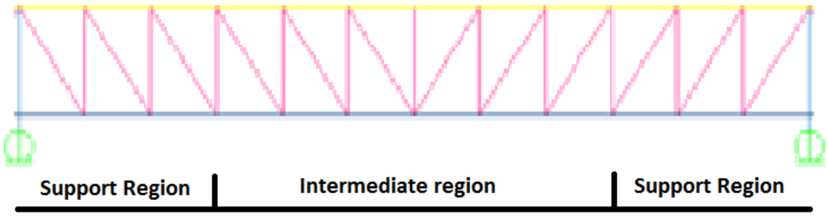
Belt conveyor	Roll radius (load and return) (*m*)	Roller Circular Frequency (*Hz*)	Load Roller Free Action (*N*)	Return roller free action (*N*)	Total action (*N*)
TR-01 (1800 *mm*)	0,051	11,234	11,323	5,308	16,631
TR-02 (1800 *mm*)	0,051	11,640	11,733	5,499	17,232

The structural system assigned to these belt conveyors has been analyzed as continuous three-dimensional flat lattice structures in which all constituent structural elements of both models analyzed use ASMT A36 steel. Truss bridges have truss modules with lengths of 1 m, providing smaller geometries in each section to be analyzed. The lattice galleries feature modules in linear lengths of 3 m to overcome larger spans, allowing for more robust structural elements compared to the structural elements of the lattice bridge. Table 8 below presents the geometries of each module with their respective geometries.

Table 8 . Structural geometries of belt conveyors under analysis

Geometry	Belt conveyor	A (*mm*)	B (*mm*)	C (*mm*)	Module Numbers
	TR-01 (1800 *mm*)	2320	1000	1400	47
	TR-02 (1800 *mm*)	4300	3000	3500	24

To apply an optimization of the structural elements analyzed to the models of these belt conveyors, the longitudinal sections of the structure, in their elevation view, were subdivided into two distinct regions, namely: support region and intermediate region, as shown in Fig.2.



Elevation View

Figure 2 - Regions of analysis with their respective views on the conveyor belt segment

For a better understanding of the two-way boundary conditions of the analyzed models, table 9 below presents the support regions that are divided into two different planes, totaling 4 support points in each section of the analyzed structural systems. As shown in this table, plane A corresponds to elevation and plane B parallel to A represented in other boundary conditions of the structure on the opposite side. The cells presented with the symbol x indicate restrictions to certain movement in the structure as specified.

Table 9 . Contouring Conditions of the Belt Conveyors Under Analysis

Belt conveyor	Plans analyzed	Translation X axis	Translation Y axis	Translation Z axis	Rotation X / Y / Z axes
TR-01 (1800 *mm*)	A	-	-	X	-
	B	-	X	X	-
TR-02 (1800 *mm*)	A	-	-	X	-
	B	-	X	X	-

3. RESULTS AND DISCUSSION

In order to understand the sizing methods of lattice structural systems used in conventional belt conveyors in trussed bridge and gallery metal structures, the action combination parameters were used according to specifications presented in technical standards. When weighting (γ) for permanent actions and for variable actions, the combination factors (ψ) change depending on the type of combination.

Static and dynamic analyzes were performed in two different structural models, one in truss bridge and one in truss gallery submitted the same actions. These actions were modified by coefficients to reduce and increase the efforts generated, as analyzed by the technical standards ABNT NBR 8800 (2008), AISC / LRFD (2010) and EUROCODE (2001).To perform the sizing in the static criteria, the conditions of two limit states established by each technical standard in question were verified. Criteria must be met for open and closed section rolled sections to be used as tensile and compressed structural members.

The results obtained for both support structures of the belt conveyor models were performed with the help of SAP 2000 v.14 using the presented standards as a sizing parameter. The dimensioned open and closed section laminated profiles followed the parametric optimization criteria for verification according to the established regions.

To perform a comparison between the analyzed metal structures, a dynamic analysis of the open section profiles was performed, generating a static overlapping stress in the metal structures under study, TR-01 (1800 *mm*) and TR-02 (1800 *mm*). Both metallic structures will be subjected to dynamic actions from the unbalance of the load rollers and return rollers under specific loading conditions, thus producing new tensions and displacement in the metal structure that were compared and analyzed.

A modal analysis was performed in the TR-01 (1800 *mm*) and TR-02 (1800 *mm*) steel structure models, submitted to four specific cases. The first corresponds to static actions arising from the structure's own weight and permanent load (due to mechanical equipment), both converted into mass, in this case considering the structure in operation, but totally discharged. The second case corresponds to static actions arising from the structure's own weight, permanent load dynamic actions. The third and fourth cases add the action of the material transported in the respective cases mentioned above. Such criteria are established by internal technical standard used in large mining complexes and with theoretical fundamental. The damping factor associated with the material attributed to the support structure was 0.02, which corresponds to steel structures as presented in bibliographies of the theme.

The criteria used to perform the dynamic analysis and design of the structural elements of both models, followed normative parameters established by the large mining complexes that guide the use of the following combinations of actions to obtain their respective natural frequencies of the supporting metallic structure, when submitted to dynamic actions, as follows: Combination 1: Self-weight + permanent load + dynamic action of empty equipment, combination 2: Own weight + permanent load + dynamic action of loaded equipment, combination 3: Self-weight + overload + dynamic action of empty equipment and combination 4: Self-weight + overload + dynamic action of loaded equipment.

The natural frequency of the structure, for each action combination indicated above, should preferably satisfy one of the following conditions: $1{,}5N_m > N_e > 1{,}25N_m$ ou $N_e > 2{,}5\,N_m$ e $0{,}8\,N_m > N_e > 0{,}575\,N_m$ ou $N_e < 0{,}425\,N_m$ where N_e is the natural frequency of the supporting structure and N_m is the frequency of the analyzed equipment. It is of fundamental importance that N_e is not a multiple of N_m either.

Table 10 below shows the natural frequencies of the TR-01 (1800 mm) and TR-02 (1800 mm) models submitted to the combinations of actions, according to the established technical standard prescriptions, verifying if there was any undesirable effect on each analyzed structure.

Table 10 . Natural frequency of models TR-01 (1800 *mm*) and TR-02 (1800 *mm*) when subjected to stock combinations

Belt conveyor	Natural Structure Frequency (*Hz*)			
	Combination 1	Combination 2	Combination 3	Combination 4
TR-01 (1800 *mm*)	6,08	4,68	4,32	3,67
TR-02 (1800 *mm*)	3,30	2,40	1,67	1,34

The TR-01 (1800 *mm*) model had higher natural frequencies compared to the TR-02 (1800 *mm*) in their respective combinations of actions. These values indicate that metal structures for conventional belt conveyors have different natural frequencies depending on the actions and the mass x rigidity ratio of the set, whether or not providing undesirable effects.

Table 11 below presents the acceptable frequency ranges for each of the indicated stock combinations that should preferably satisfy the conditions of the mining complexes over the mechanical equipment in question.

Table 11 . Acceptable fundamental frequency ranges as a function of equipment frequency

Belt conveyor	Natural Structure Frequency (*Hz*)				
	Combination 1				
	Equipment frequency (*Hz*)	Case 1	Case 2	Case 3	Case 4
TR-01 (1800 *mm*)	11,234	$N_e < 4{,}77$	$6{,}45 < N_e < 8{,}48$	$14{,}01 < N_e < 16{,}85$	$N_e > 28{,}08$
TR-02 (1800 *mm*)	11,640	$N_e < 4{,}95$	$6{,}69 < N_e < 9{,}31$	$14{,}55 < N_e < 17{,}46$	$N_e > 28{,}01$
	Combination 2				
TR-01 (1800 *mm*)	11,234	$N_e < 4{,}77$	$6{,}45 < N_e < 8{,}48$	$14{,}01 < N_e < 16{,}85$	$N_e > 28{,}08$
TR-02 (1800 *mm*)	11,640	$N_e < 4{,}95$	$6{,}69 < N_e < 9{,}31$	$14{,}55 < N_e < 17{,}46$	$N_e > 28{,}01$
	Combination 3				
TR-01 (1800 *mm*)	11,234	$N_e < 4{,}77$	$6{,}45 < N_e < 8{,}48$	$14{,}01 < N_e < 16{,}85$	$N_e > 28{,}08$
TR-02 (1800 *mm*)	11,640	$N_e < 4{,}95$	$6{,}69 < N_e < 9{,}31$	$14{,}55 < N_e < 17{,}46$	$N_e > 28{,}01$
	Combination 4				
TR-01 (1800 *mm*)	11,234	$N_e < 4{,}77$	$6{,}45 < N_e < 8{,}48$	$14{,}01 < N_e < 16{,}85$	$N_e > 28{,}08$
TR-02 (1800 *mm*)	11,640	$N_e < 4{,}95$	$6{,}69 < N_e < 9{,}31$	$14{,}55 < N_e < 17{,}46$	$N_e > 28{,}01$

Subtitle:
Caso1: $N_e < 0{,}425\,N_m$ Caso2: $0{,}8\,N_m > N_e > 0{,}575\,N_m$ Caso3: $1{,}5N_m > N_e > 1{,}25N_m$ Caso4: $N_e > 2{,}5\,N_m$

The results obtained for both bridge and lattice gallery structures were performed with the aid of the SAP 2000 program, based on the finite element methodology that was subjected to static and dynamic analysis. The open and closed section laminated profiles followed the parametric optimization criteria for further verification, according to the technical standards ABNT NBR 8800 (2008), AISC / LRFD (2010) and EUROCODE (2010) for tensile and compacted bar dimensional criteria.

Table 12 below shows the open and closed section profiles used in the TR-01 (1800 *mm*) model, meeting the guidelines of each technical standard under analysis. The following table 13 shows the open and closed section profiles used in model TR-02 (1800 *mm*).

Table 12 . Cross sections of closed and open section profiles used in model TR-01 (1800 *mm*)

Belt conveyor - TR-01 (1800 *mm*)					
ABNT NBR 8800 (2008)	EUROCODE (2010)	AISC/LRFD (2010)	Number Frame	Total Length	Total Weight
Section	Section	Section	*(und)*	*(cm)*	*(Tonf)*
L56X5,0	L56x7,0	L56x5,0	64	9750,4	0,40
2L100X13,5	2L110X13,5	2L100X13,5	12	620,0	0,18
L80X8,49	L80x9,6	L80x8,49	42	6527,3	0,65
L63,5X6,10	L63,5x8,78	L63,5x7,44	2	463,8	0,02
L88,9X8,56	L88,9x12,58	L88.9x8,56	24	3710,4	0,25
L76,2X5,52	L76,2X9,07	L76,2X7,29	34	5336,8	0,47
L88,9X8,56	L88,9X10,59	L88,9X8,56	7	927,6	0,11
L101,6X12,19	L101,6X14,57	L101,6X12,19	30	3000,0	0,59
L101,6X12,19	L101,6X14,57	L101,6X12,19	30	3000,0	0,55
		Total:	245	33336,4	3,26
Belt conveyor - TR-01 (1800 *mm*)					
ABNT NBR 8800 (2008)	EUROCODE (2010)	AISC/LRFD (2010)	Number Frame	Total Length	Total Weight
Section	Section	Section	*(und)*	*(cm)*	*(Tonf)*
TB48,3X5,0	TB48,3X6,4	TB48,3X5,6	25	3710,4	0,24
TB48,3X5,0	TB48,3X6,4	TB48,3X5,0	28	4552,4	0,24
TB141,3X12.5	TB141,3X16,0	TB141,3X14,2	12	620,0	0,24
TB60,3X7,1	TB60,3X8,0	TB60,3X7,1	32	4992,7	0,46
TB101,6X11,0	TB101,6X12,5	TB101,6X12,5	60	6000,0	1,64
TB42,2X4,5	TB42,2X5,0	TB42,2X4,5	24	3710,4	0,17
TB33,4X3,2	TB33,4X3,6	TB33,4X3,2	64	9750,4	0,23
		Total:	245	33336,4	3,24

Table 13 . Cross sections of closed and open section profiles used in model TR-02 (1800 *mm*)

Belt conveyor - TR-02 (1800 *mm*)					
ABNT NBR 8800 (2008)	EUROCODE (2010)	AISC/LRFD (2010)	Number Frame	Total Length	Total Weight
Section	Section	Section	*(und)*	*(cm)*	*(Tonf)*
W150X13,0	W150X18,0	W150X13,0	192	14625,6	0,92
W150X22,5	W150X22,5	W150X22,5	36	930,0	0,41
W310X23,8	W310X28,3	W310X23,8	126	9790,9	1,49
W250X22,5	W250X25,3	W250X22,5	6	695,7	0,05
W310X23,8	W310X28,3	W310X23,8	72	5565,6	0,57
W250X17,9	W250X22,3	W250X17,9	102	8005,2	1,08
W310X23,8	W310X28,3	W310X23,8	21	1391,4	0,25
W360X32,9	W360X39,0	W360X32,9	90	4500,0	1,36
W360X32,9	W360X39,0	W360X32,9	90	4500,0	1,27
		Total:	245735	50004,6	7,49
Belt conveyor - TR-02 (1800 *mm*)					
ABNT NBR 8800 (2008)	EUROCODE (2010)	AISC/LRFD (2010)	Number Frame	Total Length	Total Weight
Section	Section	Section	*(und)*	*(cm)*	*(Tonf)*
TB88,9X5,0	TB88,9X5,0	TB88,9X5,0	25	5565,6	0,55
TB88,9X5,0	TB88,9X5,6	TB88,9X5,0	28	6828,6	0,55
TB273,0X10,0	TB273,0X11,0	TB273,0X10,0	12	930,0	0,55
TB41,3X7,1	TB41,3X8,0	TB41,3X7,1	32	7489,0	1,05
TB273,0X12,5	TB273,0X12,5	TB273,0X12,5	60	9000,0	3,77
TB323,8X8,0	TB323,8X10,0	TB323,8X8,0	24	5565,6	0,39
TB323,8X8,0	TB323,8X10,0	TB323,8X8,0	64	14625,6	0,53
		Total:	245	5000,4,6	7,45

With the data presented for bridge and lattice structures, with approximately 15 m and 48 m lattice gallery, using the parametric optimization feature, it was adopted for both models open and closed section profiles, in which there was a great customization of the structural elements. in order to make the execution of this structural design category economically viable.

It was necessary to use 9 separate section sections with open section laminate profiles compared to 7 section sections with open section laminates for both models analyzed, which demonstrates a certain parameterization of this last profile. The technical standards adopted for sizing demonstrate that larger sections were used for EUROCODE (2010), as this technical standard presented higher values efforts. There was also similarity of cross sections between ABNT NBR 8800 (2008) and AISC / LRFD (2010) due to the similarity between the increase and reduction coefficients used.

4. CONCLUSIONS

From the studies carried out in this work it was found that, in fact, one of the sources of excitation that occurs in industrial environments can be represented by a harmonic function applied in support metallic structures used in conventional belt conveyors. In situations of unbalance of load and return rollers it was possible to define the magnitude of the dynamic effort, using specific technical standards to perform the dynamic analysis of structural elements consisting of open section profiles. The information contained in the technical standards CEMA (2006), technical manual FAÇO (1992) and ISO 1940 - 1 presented the necessary criteria for the study, reasoning and analysis of the supporting metallic structures.

When the requesting efforts generated by the static action are superimposed on those generated by the dynamic action, produced by the level of unbalance of the load and return rollers, in this case considered as a rotating machine, a careful study for the structural elements dimensioning is unnecessary. because the increase for acting voltages and permissible voltages, the changes are of small magnitude.

During the investigations, it was observed that, for structures that support small equipment such as load and return rollers, the unbalance of this one does not significantly change the dimensioning of the structural elements according to the prescriptions presented in technical norms attributed to metallic structures used in large ones. mining complexes.

It was important to observe, from the numerical simulations performed in the computational models, that the incorporated mass and the rigidity of the constituent structural elements must be accurate, since the responses present great sensitivity to these variables. Thus, any flaw in this information can completely mask the results due to dynamic analysis.

In view of the above, it is possible to state that, for the static and dynamic analysis of conveyor support metal structures and belt with belt dimension of 1800 *mm*, it is not possible to make a comparison results, because the span of the support metal structure, subjected to the same actions. It defines the sizing and, consequently, the open section profiles of the constituent structural elements.

For the dimensioned metal structures (TR-01 (1800 *mm*) - lattice bridge and TR-02 (1800 *mm*) - lattice gallery) according to the active actions and established, the EUROCODE (2010) technical standard presents more conservative values in comparison to ABNT NBR 8800 (2008) and AISC / LRFD (2010). Therefore, the best technical standard to be adopted for the sizing of the working forces together with the cross sections of rolled profiles of open and closed section will be EUROCODE (2010), according to results presented.

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6. RESPONSIBILITY NOTICE