Aashto 2018 pdf español

 Home Autodesk Bentley CSI Microsoft Textbooks Books Standards Ing. Civic 1. BOLIVARIAN REUSIA REINIC UNIAN INSTITUTE SANTIAGO MARO HEALTH PUERTO ORDAS Author: Dellen Rosaidimir Professor: Ing. Argenis Soledo Puerto Ordaz, October 2015 2. CHAPTER 2: STANDARD AASHTO REGULATIONS STANDARD 2.1. GENERAL The most important aspects of AASHTO Standard Specifications for Highway Bridges Standard for Bridge Add-on Design are compiled in the next chapter. Also, some of the considerations that are needed in the Guide on the Road, Chapter 3.1000 ! Bridges and related works (2002) containing provisions imposed by the Department of Bridges of The Road M.O.P. 2.2. LOADS (AASHTO STANDARD, Section 3, Part A) Each structure is subjected to different types of loads over the life of the system. These loads vary according to geographic location and geographical location. The structure, when designed, must contemplate all these loads, or those with the greatest impact, so that throughout its useful work it is able to withstand them, individually and in combination. Loads analyzed in bridge design are: - - Dead load - Live Charge - Impact or dynamic effect of the vehicle's live load - Wind load - Other forces or actions such as: Braking, Centrifugal Force, Heat Voltage, Earth Pressure, Water Pressure, Sismo, etc. when applicable. The size of the various elements of the structure can be performed by the method of service loads: (Allowable stress design) or the method of designing the load factor (LFD). 2.2.1. Dead load (AASHTO standard, section 3.3) 3. The dead load consists of the weight of a full add-on. Includes dashboard, aisles, rolling folders and fittings such as pipes, cables, etc. The weight of the unit used for concrete should be: 2.5 (3mT) for slabs, beams and corridors 2.4 (3mT) for sidewalks 2.2.2. Live Load (AASHTO Standard, section 3.4) Live load consists of the weight of moving loads on the bridge, such as vehicles and pedestrians. 2.2.2.1. Loading a vehicle with a mobile load consists of loading standard trucks or cargo sash. 2.2.2.1.1. Standard Truck Truck occupies a 3.05 (m) wide transit track located on a 3.66-meter wide design track(m; this truck must be placed on each track design, along the carriageway, as many times as the track design can be placed on this road can be placed on this road Transit routes should not be considered. However, for roads between 6.1 and 7.32 (m) roads should consider two design paths, each of which is half the width of the roadway. Table 3,201.5.C Guide to vol Road. III indicates width and berm for use in accordance with the category of roads. At the suggestion of Valdivia Road, in this memory, the width of 4 (m), including berm, will be used. Figure 2.1: Truck width according to AASHTO standard. Sizes in(m). The AASHTO standard defines four classes of standard trucks: H 15 - 44 H 20 - 44 HS 15 - 44 HS 20 - 44 a) Truck H: Cargo H consists of a two-axis truck, as shown below. Figure 2.2: Truck Type H. Truck H 20-44 weighs 3.63 (T) and 14.52 (T) on the front and rear alys respectively. Instead, the H 15-44 truck has a 5. 2.72 (T) and 10.88 (T) on the respective alyals, which corresponds to 75% of truck H 20-44. b) HS Truck: The HS load consists of a tractor truck with a semi-trailer. The HS 20-44 truck weighs 3.63 (T) on the front axle and 14.52 (T) on each of the rear axles and the one that deals with our country. The HS 15-44 truck weighs 2.72 (T) on the front axle and 10.88 (T) on each of the rear axles, which corresponds to 75% of the HS 20-44 truck. Figure 2.3: HS Truck loaded 20-44. Figure 2.4: Load on the axis of the HS 20-44 truck. The division between the rear axes of the truck is considered variable, as this option varies depending on the current trucks, and 6. it also allows you to take into account the location of the loads in order to call for maximum effort on the requested beams. 2.2.2.1.2. Sasha's load (AASHTO standard, section 3.7.1.2.) The fold consists of an even load on the linear meter of the transit route combined with a concentrated load (or two concentrated loads in the case of continuous sections) placed on the beam, in this position to cause maximum effort. Figure 2.5: Sasha Loads. According to the AASHTO STANDARD standard, different concentrated loads must be used to calculate the points and abbreviations. Lighter concentrated loads should be used to calculate the curved loads, and heavier concentrated loads should be used to calculate the cutting load. 2.2.2.2. Pedestrian load (AASHTO Standard, section 3.14) 7. Pedestrian mobile load on corridors and adjacent supports consists of a residential load of 415 (2 m kg). For the construction of beams supporting corridors and board, pedestrian load must be taken, as shown below: Table 2.1: Pedestrian live load. For bridges with lights more than 30.5 (m) pedestrian load is given: 15 According to the standard AASHTO STANDARD, for calculation and reductions, various concentrated loads should be used. Lighter concentrated loads should be used to calculate the curved loads, and heavier concentrated loads should be used to calculate the cutting load. (2m Kg) 0 to 7.6 415 7.6 to 30.5 293 For bridges with lights more than 30.5 (m), pedestrian load is given:)24.151.1 ()47.446447.146 (W L P Where: P - Pedestrian live load 293 (2m Kg) L - Loaded passage length (m) W - Pass width (m) Bridges designed exclusively for pedestrian and/or cycling should be designed for pedestrian load 415 (2m Kg). because she had nothing to do with it. 2.2.3. Odds affecting live load efforts 2.2.3.1. Impact Factor (AASHTO Standard, section 3.8.2) Efforts caused by car live load should be increased in order to include dynamic, vibration and shock effects. This increase should be applied to the add-on design, pillars and strains 8. (Group A, referred to in paragraph 3.8.1.1 of the AASTO Standard), is not quite in the construction of stirrups, foundations, wooden structures and pedestrian load (Group B). The impact rate is calculated as one plus impact percentage. Where: L - Length meters from the light part, which is charged to get maximum voltage in the element. It depends on the participant and the request for analysis. At the direction of the civil engineer, Mr. Rodrigo Mancilla T., the impact factor to be used to calculate the moment and cut voltages will be calculated using L - Estimated Light - Distance between the beam elastomer support centers. 2.2.3.2. DC Distribution Ratio (AASHTO Standard, section 3.23.1) The distribution factor is a factor derived from a complex theoretical analysis and is aimed at interpreting the distribution of cargo wheels over longitudinal beams. -The internal beams Moment bend due to the car load for each internal beam, must be multiplied by a fraction of the load of the wheel, which depends on the type of carriage, the type of beam and the number of transit routes. The share of the wheel load, also called the distribution factor, is determined by the table 3.23.1 of the AASHTO standard. For the roadway and reinforced concrete T-rays, the distribution factor that provides the standard: C d'S/ 1.829 Where: S - Separation between beams (m) In case the S is larger than 3.05 (m), the fraction of the load of the wheel on each beam, should be the reaction of each beam due to the load of the heaviest axis of the truck HS 20-44, assuming that the snty sn In our country, all the busy project roads are used for this purpose. - The outer beams of the Dead load on the outer beams of the bridge, should be that part of the road is supported by them. Corridors, railings and sidewalks if 9. installed after sl forged, they can be evenly distributed on the beams. The moment of bending due to the car load for each external beam, should be multiplied by a fraction of the load of the wheel. This fraction will be the reaction of each beam due to the load of the heaviest axis of the HS 20-44 truck, assuming that the sn snaction acts as a beam just lying between the rays. If the external beam factor is less than the internal beam factor, the last factor must be taken for the external beam. When the outer beam supports pedestrian load, vehicle load, impact and, in addition, the design is designed by ASD, allowable loads should be increased by 25% to combine the dead load, pedestrian load, load and impact of the vehicle, providing the beam with a capacity no less than it would have been necessary if the corridors did not exist. Cut distribution ratios will be accepted in the same way as they are at the moment, as there is no information about them in the standard. 2.2.3.3. The CR reduction rate (AASHTO standard, section 3.12) In accordance with the AASTO standard, where maximum loads are generated on any element due to the simultaneous loading of multiple transit routes, the following percentages of vehicle loading should be used in view of the lower probability of occurrence. 2.2.3.4. The majority ratio, the CM as an internal M.O.P. order, and in view of the increased load of trucks moving on the country's roads, was added to the HS 20-44 load factor. This majority ratio is considered to be 20%, i.e. C mop x 1.2 2.2.4. Request to load vehicles on beams 10. 2.2.4.1. The moment of bending due to the vehicle's live load will be the highest value received between the time of production of the HS 20-44 load truck (used in our country) and the time of production of the HS 20-44 load shutter. The maximum loading time of the HS 20-44 truck is determined by power lines, as shown in the following picture: Figure 2.6: HS 20-44 Truck load for maximum moment calculation, L more than 10.8 (m) 2.2.4.2. The maximum cutting force is obtained by placing one of the P-loads of the HS 20-44 truck on one of the supports. Figure 2.7: HS 20-44 truck load for maximum cutting calculation, L10.8(m) 2.3. SL DESIGN (AASHTO STANDARD, SECTION 3.24) 11. It's time one live car per meter of muzzle width is calculated according to the following methods, if not more accurate. 2.3.1. Intermediate sections of the Bend moment per horse width meter should be calculated according to cases A or B, given in section 3.24.3.1 and 3.24.3.2 of the AASHTO Standard. This work will use Hull A: Basic reinforcement perpendicular to traffic (AASHTO Standard, section 3.24.3.1) Bend moment (per meter of horse width) caused by vehicle loads, Defined by the following formula: M-S 0.1) 61/9.74'P (T.m/m) Where: S - Effective sn sn sn sn sn sn sl length (m) P x 7.26 (T) for HS 20-44 Truck This time will be affected by the impact rates, most and continuity. For continuous handles on three or more beams, a continuity factor of 0.8 should be applied to the aforementioned formula. 2.3.2. Cantilever sections (AASHTO Standard, section 3.24.5) The formula for calculating the moment due to the car load on cantilever horses, takes into account that they take loads regardless of the impact of the edge reinforcement placed along its ends. In design, the wheel load should be located 0.305 (m) from the side of the wheel saver. If the aisles are not used, the load on the wheel should be 0.305(m) from the inner edge of the railing or protection. When designing passes and handles, the wheel load should be positioned above the aisle and should be 0.305 (m) from the edge of 12. Inside the railing. This is, ultimately, the truck coming on it. As for the previous section, case A standard will be used to calculate the effort. Case A: Basic reinforcement is perpendicular to transit: Each wheel load must be distributed along the width of the muzzle according to the following expression. E-O.8X 1.143 (m) Where: X - Distance in meters from the loading point to the point of support of the cantilever (m) E - Distribution width on the muzzle of the wheel load (m) Moment per meter of width sle will be estimated by the expression: Where: P x 7.26 (T). HS truck load wheel 20-44 2.3.3. Distribution armor (AASHTO standard, section 3.24.10.) Distribution reinforcement must be orthogonal and between the main strengthening of the horse. The amount of reinforcement of the distribution will be as a percentage of the reinforcements needed for a positive moment. If the main reinforcement is perpendicular to transit When using the main rebar is perpendicular to transit, the amount specified as a distribution fixture should be located in the central part of sn sn sss, and at least 50% armor on the other 2 two-quarters sn sn sn sn sn. 2.4 IRON CONCRETE (AASHTO STANDARD, SECTION 8) 2.4.1. General 13. The specifications in this section are designed for the design of reinforced concrete (not pressed) concrete bridge constructions. It should be taken into account that, according to the NCh170 standard in Chile, concrete is classified by degrees, either against resistance to compression or against resistance to flexible traction. The compression resistance rating is measured in 200 (mm) edge cubic pattern according to NCh1017 and NCh1037 standards at the age of 28 days. Given that THE resistance of FC to concretes specified by AASHTO is based on cylindrical samples tests, the following table shows both the classification and the relationship between them. 2.4.2. Analysis (AASTO Standard, Section 8, Part B): All members of the structure should be designed to maximize the impact of the above loads and be determined by the theory of elastic analysis. 2.4.2.2. Effective lights (AASHTO Standard, section 8.8) The length of light (effective) for participants who are not fully built with their supports will be free light plus the height of the participant, but should not exceed the distance between the support centers. The effective length of the horses is listed in Article 3.24.1 of the AASTO Standard. This says: - For just supported pens, effective light will be the distance between the center beams that support it, but it should not exceed the free light plus the thickness of sn sn sn sn sn sn sn. - For monolithic horses to continue on 2 or more supports, its effective light will be free light between the rays that support it. 2.4.2.3. Deformation control (AASHTO Standard, section 8.9) Elements of the bridge's design to be curved must be designed to be sufficiently rigid and thus limit deviations that may adversely affect the strength or operational capabilities of the structure. 14. 2.4.2.3.1. Superstructure Height Limits (AASHTO Standard, section 8.9.2) Minimum heights in Table 2.4. it is recommended if the calculation of deviations indicates that lower heights can be used without side effects. Table 2.4: Minimum recommended heights for permanent height elements. (AASHTO Standard,) 2.4.2.3.2. Restrictions on the deformation of the add-on. (AASHTO Standard, section 8.9.3) The following criteria are recommended in calculating deviations: participants who have light or continuous light will preferably be designed to reduce the deviation due to live load plus exposure to no exceed L/800 light, except for bridges in urban areas used in part by pedestrians, where the cause should not exceed L/1000. Deviation in the cantilever due to the car load plus impact, preferably will be limited to the L/300 length cantilever, except when it is also used by pedestrians where the cause will be L/375. 2.4.2.4. Wing width in compression (AASHTO Standard, section 8.10) T-beams: Total effective sist width as A T-beam wing should not exceed a quarter of an effective light beam. The effective width of the wing protruding from each side of the soul should not exceed six times the thickness of the slush or half the free distance to the next soul (the distance between the edges of the souls of successive rays). 2.4.2.5. Aperture or crossbar. (AASHTO Standard, section 8.12) The standard indicates that the aperture should be used at the ends of the T-rays and box beams, unless other methods are used to resist lateral strength and maintain the geometric section of the board. Apertures can be 15. ignored only if a detailed structural analysis demonstrates the correct behavior of the structure. The crossbars are obligatory on bridges located in the seismic zone No. 3, in accordance with article 3.1004.7 of the Road Guide on Tom III Street. 2.4.3. Service load design method (AASHTO standard, section 8.15) 2.4.3.1. Voltage is allowed to design all the designs and elements of these structures, H 30 concrete (fc' 25 (MPa) and A63 -42H of strengthening steel should be considered. Section 8.15.2.1) Tensions on concrete should not exceed the following: - Extreme pressure of fiber at compression - fc s 0.4 fc'(MPa- Extreme fiber tension in thrust - t f s 0.21 r f (MPa) - Break module - r f s 0.66 fc '(MPa Strengthening). Section 8.15.2.2) Acceptable voltages in reinforcement, fs , are: - Steel with creeping voltage 280 or 350 (MPa) fs 140 (MPa) - Steel with a creeping voltage of 420 (MPa) or more, fs .168. Bending (AASTO standard, Annex A, Section 5) 2.4.3.2.1. The design hypothesis is in bending, the following design hypothesis should be considered for a permissible method of stress. - In reinforced concrete members concrete does not withstand traction. - The reason for the modules, n'c e E, should be taken as the nearest number (but not less than 6). 31wb - Soul Width d - Distance from extreme compression fiber to the center of reinforcement steel. 16. 2.4.3.3.1. Cutting efforts taken by concrete (ACI 99, Annex A, section 7.4.1) For members subject only to cutting and bending, cutting efforts supported by concrete, CV, can be taken as cf'09.0) (MPa. More detailed voltage calculation 2.4.3.3.2 can be reduced. Strengthening the area. (ACI 99, Annex A, section 7.5.6.2) When the voltage cutting design, V, exceeds the voltage cutting supported by concrete, CV, steel reinforcement should be provided. If the steel reinforcement is perpendicular to the axis of the element, the area is 2.4.3.3.3. Restrictions for cutting reinforcements (ACI 99, Annex A Section 7.5.5.3) Minimum reinforcement for stress cutting Minimum strengthening area should be provided in all bending members, except s handles and shoes, where the design of stress cutting, V, exceeds half the permissible stress cutting supported by concrete, CV. When cutting reinforcements are required, the area is provided 2.4.3.3.4. Strengthening the limit interval (ACI 99, Annex A, Section 7.6) The minimum free distance between parallel strips of the layer should be the nominal diameter of the bar, but not less than 25 (mm). When the parallel rebar is placed on two or more layers, the lattice on the upper layers should be located precisely above the lower layers, with a free distance between layers of at least 25 (mm). For the handle, the separation of the main armor by bending should not be more than 3 times the thickness of the sn ssa, nor 500 (mm) 2.4.3.4. Coverage (MCV3 2002, section 3.1003.604) 17. The following minimum coatings should be provided for steel strengthening: - Beam: Main, upper and lower reinforcement: 5 stirrups, berths, zunchos: 4 - Upper Belt reinforcements: 4 Lower rebar: 2.5 Chapter 3: NORMA AASHTO LRFD BRIDGE SPECIFICATION DESIGN DESIGN 3.1 PROVISIONS. GENERAL The most significant change made by the AASHTO LRFD standard in the calculation of bridge construction is the use of the LRFD: Load and Resistance Factor Design method, which corresponds to the method of the latest limit states, taking into account the factors for each load and for each nominal resistance. Another important aspect that introduced this standard is how to combine loads, as it takes into account some factors that will change the bridge's safety margin, giving greater reliability to the design. These factors correspond to the ratios of air duct, redundancy and the importance of structure. This standard also introduced a new way to combine the vehicle load model because three types of live load vehicles are installed: Truck Design, Tandem Design and Sash Load Design. In general, this chapter shows the most important provisions of the AASTO LRF (1998) standard, which will be used in the subsequent design of the add-ons of selected models. 3.2. FINAL STATES (AASHTO LRFD, SECTION 1.3.2.) The state of the border determines the conditions that you want the structure to meet. In general, the element you will have to meet various border states. The limit states defined by the AASHTO LRFD standard are as follows: 3.2.1. Service Restriction Status (AASHTO LRFD, Section 1.3.2.2) 18. It should be seen as a limitation on stress, deformation and the width of the crack, in normal operating conditions. The load combinations of this state are as follows (AASHTO LRFD, section 3.4): SERVICE I: A combination of loads representing the normal operation of a bridge with a wind of 90 (km/h), taking all loads with their nominal values. This is also due to the control of deviations of buried metal structures, tunnel coatings and thermoplastic tubes, as well as control of the width of cracks of reinforced concrete structures. This combination of loads should also be used to study the resilience of the slopes. SERVICE II: A load combination designed to control the creep of steel structures and the failure of critical connections due to the vehicle's live load. SERVICE III: A combination of thrust-only thrust in pre-tightened concrete structures to control cracking. 3.2.2. Limitation of fatigue and fracture status (AASHTO LRFD, section 1.3.2.3) The state of fatigue restriction should be seen as restrictions on stress range. The fracture limit should be considered as a set of material strength requirements in AASHTO material specifications. The combination of this limit load is this (AASHTO LRFD, section 3.4): FATIGA: A combination of loads associated with repetitive load on a vehicle and dynamic reaction caused by truck design, as stated in article 3.4.2.2 of this thesis. It defines the final criteria for the capacity of the structure to ensure its strength and stability, both local and global, to withstand statistically significant load combinations that are expected to overcome 19. in my life. The combinations of this limit state are as follows (AASHTO LRFD, section 3.4): RESISTANCE I: A basic load combination for a normal windless truck. RESISTANCE II: A combination of loads representing the use of the bridge by special design vehicles specified by the owner, limited turnover of vehicles (overweight) or both, without wind. RESISTANCE III: A load combination representing a bridge prone to wind speeds of more than 90 (hr Km) RESISTANCE IV: A load combination representing a high ratio between requests caused by overload and dead load. RESISTANCE V: A load combination representing the use of bridge with wind speeds of 90 (hr Km) 3.2.4. Extreme Conditions of Extreme Events (AASHTO LRFD, section 1.3.2.5) Extreme State of Extreme Events should be considered to ensure the structural survival of a bridge during a significant flood or isism, or when it is rammed by a vessel, vehicle or ice stream, possibly in the face of subversion. The combinations of this state limit are as follows (AASHTO LRFD, section 3.4): EXTREME EVENT I: A load combination that includes Extreme Event II: A combination of loads including ice load, collision of boats and vehicles, and some hydraulic events with reduced congestion is different from that which is part of the vehicle collision load. 3.3. BASIC DESIGN EQUATION (AASHTO LRFD, section 1.3.2.1) The LRFD method can be expressed by the following expression: 20. Where: The load change factor associated with wiring, redundancy, and structure performance. Load factor, statistical multiplier applicable to requests for query resistance, statistical multiplier applied to nominal resistors. The nominal resistance resistance of the resistance Calculation The term on the left corresponds to The Required Resistance and that of the right to the Computation Resistance, the latter resistance is provided by the structural component considered (beam, column, etc.). Factor I depends on the D, R and I ratios associated with wiring, redundancy, and operating value, respectively. Ductility (AASHTO LRFD, section 1.3.3) The structure can have two types of behavior: brittle or ductile. Fragile behavior is undesirable, as it is usually associated with a sudden loss of payload capacity when exceeding the elastic limit. Dotile behavior is characterized by significant insouring deformities before any loss of potential occurs. This behaviour is a warning of structural failure. Duct factor for resistance limitation state: 1.05 For non-electrical components and compounds 1.00 For conventional 0.95 Components and Compounds with Flow More Than Indicated for Other Frontier States: 1.00 Excess (AASHTO LRFD, Section 1.3.4) 21. If there is no good reason, you should use continuous multi-load structures. These structures are able to withstand loads, even after the loss of an important element or connection. Redundancy factor for resistance limit state: 1.05 For non-failure of R- components For normal redundancy levels R 0.95 For exceptional redundancy levels For other marginal states: R x 1.00 Operational value (AASHTO LRFD, section 1.3.5). It is based on social requirements, security and defence requirements. The operating value for the resistance limit state: 1.05 For bridges of 1.00 For typical bridges 0.95 For relatively less important bridges for other boundary states: 1.00 Finally, the factor is determined as follows: - When the maximum value of 95.0 I R Di is required when the minimum value is required. 3.4. CARGO (AASHTO LRFD, section 3.4.1) 3.4.1. Constant Loads (AASHTO LRFD, Section 3.5) Two groups differ: Permanent Loads (AASHTO LRFD, Section 3.5.1) and Soil Loads (AASHTO LRFD, Section 3.5.2). Constant loads are subdivided into: DC: Constant loading of structural components and non-structural fittings. DW: Constant loading of carrier surfaces and utility facilities. Soil loads are subdivided into: EH: Horizontal Ground Push ES: Soil Overload DD: Negative Friction 22. EV: Vertical filler floor pressure 3.4.2. Transitional Loads (AASHTO LRFD, section 3.3.2) Identified the following transitional loads: BR: CE vehicle braking force: centrifugal vehicle CR: Creep or Slow Flow CT: Vehicle collision force CV: The force of the collision of the equalizer vessel: Sismo R: IC Friction: ICE Load IM: Dynamic Load LL: Live Vehicle Load LS: Live Overload PL: Pedestrian Load SE: Sh Settlement: TG Compression: Tu Temperature Gradient: Unified WA Temperature: Hydraulic Load and Water Flow Pressure WL: Wind Over Automotive Load 23. WS: The winds over the load structure to be used in this memory are: DC: Constant loading of STRUCTURAL DW components: Constant load of IM bearing surfaces: Dynamic load LL: Live load vehicle 3.4.2.1. Live Load (AASHTO LRFD, Section 3.6) The load of a live vehicle consists of the weight of moving loads on the bridge. You have two types: car and pedestrian. 3.4.2.1.1. Pedestrian load (AASHTO LRFD, section 3.6.1.6) Pedestrian load consists of a load of 0.0036 (MPa), which applies to all passages with more than 600 (mm), and which is considered simultaneously with the load of the vehicle. Bridges used only for walking and/or cycling will be designed for a live load of 0.0041 (MPa) At the direction of the civil engineer Mr. Rodrigo Mancilla T., the pedestrian load will not be used for our design, as it has nothing to do with it. 3.4.2.1.2. Transport load (AASHTO LRFD, section 3.6.1.2) The number of transit routes to be fixed is the entire part of the quant: W/ 3.6 Where: W without a road, between road storage or between protection (m) For roads 6.0 to 7.2 (m) are considered two transit routes, each half wide. 24. Three types of loads have been identified: cargo, sash Load and Tandem Load. The total load of the vehicle to be used is labeled HL 93 Load This load will be the biggest request from combinations: - Truck Load and Sash Load (used in our country) - Tandem Load and Sash Load. Truck loading (AASHTO LRFD, section 3.6.1.2.2) the AASHTO LRFD project truck is similar to the HS 20-44 truck specified in the Standard Standard. Cross, the width of the construction route is 3.6 (m), with a wheel axis distance of 1.8(m), as shown in the following picture. Figure 3.1: AASHTO LRFD Truck Section. In the longitudinal direction there is a wheelbase of 4.3 (m) and another, which fluctuates between 4.3 (m) and 9.0 (m), given that it causes maximum requests. The last two axes receive most of the load, 14.8 (T) on each axis, and 3.57 (T) on the front axis, as shown in the following picture: 25. Figure 3.2: Long-way section of AASHTO LRFD truck. 3.4.2.1.2.2. Tandem Load (AASHTO LRFD, section 3.6.1.2.3): The design tandem consists of a pair of load-lys, equal to 11.22 (T), marked longitudinal by 1.2 (m) The cross-range wheel should be 1.8 (m) Figure 3.3: Tandem load. 3.4.2.1.2.3. Sash loading (AASHTO LRFD, section 3.6.1.2.4) Belt load consists of a load of 0.949 (mT) evenly distributed in a longitudinal direction. Cross,900, the belt load is supposed to be evenly distributed in width of 3 (m) 26. Figure 3.4: AASHTO LRFD Belt Load. 3.4.2.2. Load fatigue (AASHTO LRFD, section 3.6.1.4) Mobile fatigue load consists of a truck equal to what is set in article 3.4.2.1.2.1 of this argument, only that with a fixed interval of 9.0 (m) between a pressure 14.8 (T) In addition, the ash load is not considered. The state of fatigue does not need to be investigated for multi-beam concrete slabs. 3.4.2.3. Acceptable dynamic load IM (AASHTO LRFD, section 3.6.2) Static effects of a truck or design tandem should be increased by a specified percentage. 3.4.3. Load combinations and factors (AASHTO LRFD, section 3.4.1) Load combinations considered for each of the limit states have different load factors. 3.4.4. Apply loads 3.4.4.1. The use of loads (AASHTO LRFD, section 3.6.1.3) The load on the vehicle to be used is defined as the most adverse condition between: cargo plus cargo sash or tandem load plus load belt. In the design, the truck or tandem load should be spread across, so that the center of the outer wheel is larger: - 0.3 (m) from the inner face of handaower or railing, for construction 27. cantilever sleds. - 0.6 (m) edge of the design path, for the design of all other elements. 3.4.4.2. Distribution ratios If the bridge is analyzed using approximate methods, distribution ratios should be used in calculating structures. The distribution of the automotive live load can be used for beams and crossbars, except for the steel beams of the box with a concrete slab, if they meet the following conditions (AASHTO LRFD, section 4.6.2.2.1): - Permanent width of the slab. The number of beams is at least three. - Parallel beams with roughly the same rigidity. - The rolling stock surface in the cantilever should not exceed 910 mm. The curvature in the aircraft is less than the limit specified in article 4.6.1.2 of the AASHTO LRFD standard. The cross section is permanent and corresponds to one of the cross sections shown in table 4.6.2.2.1-1-1 of the AASHTO LRFD standard. According to article 4.6.2.2.1 of the AASHTO LRFD standard, for a greater separation between beams than the applicability range specified in the articles tables 4.6.2.2.2 and 4.6.2.2.3 of the AASHTO LRFD standard, the overload on each beam must be the reaction of the tracks downloaded by the law of the moment. The moment and incision distribution ratios used to design bridge add-ons with reinforced concrete beams are shown in the following tables, which makes the difference between the inner beams and the outer beams. (AASHTO LRFD, tables 4.6.2.2.2b-1, 4.6.2.2d-1, 4.6.2.2.3a- 1, 4.6.2.2.3b-1) 3.5. RESISTANCE FACTORS (AASHTO LRFD, section 5.5.4.2) Resistance reduction factors are multipliers that apply to the nominal resistance of each element. They vary depending on the item that is being considered, the type of request and the material used. 28. 3.7. THE CONSTRUCTION OF AN ARMED CONCRETE SLAB (AASHTO RFD, SECTION 9.7) An approximate elastic method (indicated in article 4.6.2.1 of the AASHTO LRFD standard), a refined method (indicated in article 4.6.3.2 of the AASTO LRFD standard) or an empirical method (indicated in article 9.7.2 of the AASTO LRF standard) can be used for the design of reinforced concrete designs. The approximate elastic method, also known as the strip method, mimics stripes that move from one side of the board to the other, modeling them as simply supported beams. This method is consistent with a method similar to that used in the AASHTO standard. Method is a model of a bridge horse and a beam system with finite elements. The empirical method of designing concrete slabs is not a method of analysis, but a procedure for fixing the amount of armor that the stove needs. This method applies to the inner sections of the salt s handle. Not used for cantilever sections for sleighs. The minimum thickness of the slash should be (AASHTO LRFD, section 9.7.1.1):175MIN e (mm) The design uses coatings shown in section 3.1003.604 of Road Manual Volume III (2002). 3.7.1. Designing the central sections with an empirical method (AASHTO LRFD, section 9.7.2) According to the AASHTO LRFD standard, studies have shown that the structural action by which concrete slabs resist wheel loads does not bend, but is a membrane of internal complex tension, citing the inner arc effect, so resistance requires only a minimum amount of isure. This steel reinforcement provides local bend resistance and is required for a global conclusion and thus develop the arc effect. The design of the slab using this method can be performed if the following conditions are met (AASHTO LRFD, section 9.7.2.4) Auxiliary elements must be designed of steel or concrete. The board is completely concreted in place and cured to water. 29. The board is evenly thick, with the exception of wing shells and other local thickness increases for horses developed by the empirical method, should be available four layers of isotropic armor. Reinforcements will be placed as close to the outer surface of the muzzle as allowed by the coatings. Armor should be provided on each side sn sn sn sn sn sn sn sn, with external layers located in the direction of effective length. As revealed by paragraph 9.7.2.5 of the AASHTO LRFD standard, The minimum amount of steel will be: 0.57/(mm)2 (mm) For each lower layer 0.38/ (mm) 2 (mm) For each top layer the distance should not exceed 450 (mm), and the arm strengthening steel should have resistance of at least 420 (MPa) 3.7.2. The overhang design (AASHTO LRFD, Section 13, Annex A) Strictly, board overhangs must be designed with the following design in mind separately. 1st case: transverse and longitudinal forces specified in article A.13.2 of the AASHTO LRFD standard. Limit the status corresponding to extreme event. Second case: Vertical forces specified in article A.13.2 of the AASHTO LRFD standard. Limit the status corresponding to extreme event. 3rd case: Load on the canopy, as stated in article 3.6.1 of the AASHTO LRFD standard. Limit status corresponding to According to the testimony of Mr. Rodrigo Mancilla, the first two cases will not be verified. An approximate elastic design method will be used for design according to the 3rd case. The equivalent width of the track can be taken, as indicated in table 4.6.2.1.3-1 of the AASHTO LRFD standard. For canopies where applicable, article 3.6.1.3.3.4 of the AASHTO LRFD standard may be used instead of the table. The article stipulates that for the design of cantilever pens do not exceed 1.8 (m) from the central line 30. From the outer beam to the inner face structurally continuous concrete protection, the outer row of wheel loads can be replaced by an evenly distributed load line of 1.46 (mT) located 0.3(m) from the inner face of the railing. Estimated loads on cantilever sn sle will be applied using a free body diagram, regardless of other sections of the track. In this thesis, the board to be used will be specific. In this case, the equivalent width of the track, E, is given by the following expression (AASHTO LRFD, table 4.6.2.1.3-1): E x 1.14 and 0.833'X Where: X - Distance between the center of the outer wheel and the support point. 3.8.1. Materials properties - Concrete concrete used for all structures must be H30 type, with f'c' 25 (MPa). (a) Elasticity Module (AASHTO LRFD, section 5.4.2.4) Elasticity module for normal density concrete, 3.8.2. Limits (AASHTO LRFD, Section 5.5.) 3.8.2.1. Service Restriction Status (AASHTO LRFD, section 5.5.2.) Should check the strain and cracks for reinforced concrete beams. The iron-concrete slab does not need to be checked for this limiting condition, as it is accepted that it meets the requirements. 3.8.2.2. Fatigue Limitation Status (AASHTO LRFD, section 5.5.3.) This border state does not need to be investigated for reinforced concrete slabs in multifunctional applications, as is the case in our case. In the case of reinforced concrete beams, this limit status must be checked for steel bars. - Strengthening the voltage bars in the centroid strengthening steel, 31. as a result of the fatigue load combination listed in table 3.4.1-1 of the AASHTO LRFD standard, should not exceed 3.8.2.3. Resistance Limit State (AASHTO LRFD, section 5.5.4) For the resistance limit state, which multiplies to nominal resistance of the elements considered: For bending and thrust: 0.9 For cutting and torque: 0.9 3.8.3.2. Strengthening Limit (A) Minimum reinforcement (ACI 2005, section 10.5.1) In any section of the bending element when thrust reinforcement is required for analysis, provided there is no need to lower than received. 3.8.3.4. Deformities (AASHTO LRFD, section 5.7.3.6.2) If the bridge owner decides to control deformities, the following principles should be applied: - When investigating the maximum deviation, all project strips must be loaded, and it should be assumed that all the carrier elements are deformed in the same way. - You should use a live car load, including a dynamic increase in load. The combination of loads to be used will serve the I table 3.4.1-1 of the AASHTO LRFD standard. Real year congestion should be taken from article 3.6.1.3.2; This means that the deviation should be considered as the highest value between: a) Deviation only because of the truck design, or b) Deviation due to 25% of the truck design plus the load shutter. In the absence of other criteria, the following deviation limits for steel, aluminium and/or concrete structures (AASHTO LRFD, section 2.5.2.6.2): 32 can be taken into account. Vehicle load, total: L/800 - Vehicles and/or pedestrian loads: L/1000 - Vehicle load on overhangs: L/300 - Vehicles and/or pedestrian loads on overhangs: L/375 3.9. COATINGS (MCV3 2002, section 3.1003.604) The following minimum coatings should be provided for the strengthening of steel: Beam: Main, top and bottom reinforcement: 5 stirrups, berths, zunchos: 4 Upper entrenched: 4 Lower fixtures: 2.5 3.10. ARMOR SPACING (ACI 2005, section 7.6) The minimum free distance between parallel strips of layer should be the nominal diameter of the bar, but at least 25 (mm) When placing parallel reinforcements in two or more layers, the lattice of the upper layers should be placed on the lower layers, with a free distance between layers of at least 25 (mm) On the walls and slings, except for ribbed handles, the separation of the main fixture by bending should not be more than the 3rd thickness of the wall or sling, nor 450 (mm) aashto lrfd 2018 pdf español. aashto 2018 pdf español. aashto lrfd 2018 español