State of California
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GUIDELINES FOR THE SUBMISSION OF DESIGNS, PLANS AND SPECIFICATIONS PRIOR TO CONSTRUCTION OF NEW, RELOCATED OR MODIFIED PASSENGER TRAMWAYS

The following guidelines may be used for the submission of designs, plans, and specifications prior to the construction of new, relocated or modified passenger tramways.

Tramway Technical Data

- Submit passenger tramway equipment data sheet.
- Submit safety factor calculations for tension ropes, tension chains and attachments.

A. Drawing Standards

(1) Each drawing and the cover page of bound documents should have a title block, which clearly indicates the project for which the document is being submitted. The title block should indicate the name of the licensee and the name of the tramway. The title block should also indicate the title of the drawing, drawing number, revision number, and date, as applicable. The title block should have lettering not less than 3/16 inch high.

(2) Drawings and submissions received will be assumed "Certified for Construction" unless otherwise noted. "As Built" drawings shall be clearly identified.

(3) Manufacturers who are doing multiple installations may submit one complete set of "Standard Drawings" per season. Each drawing should clearly indicate that it is a "Manufacturer's Standard Drawing." In addition, a drawing log should be submitted with a statement that these drawings are for use on multiple installations. Submission for individual installations need not include copies of "Standard Drawings," provided that a drawing log is submitted which clearly indicates that standard drawings are being used and have been previously submitted. Drawing logs should be signed and sealed by a professional engineer, registered in California.

(4) A relocated tramway is considered a new installation. Therefore, the current submission requirements for new installations should be complied with if a tramway is relocated. This includes requirements for drawing submission and certification.

B. Design and Drawing Submittals

The engineer should submit a drawing log of all pertinent drawings. One copy of each drawing listed on the drawing log should be submitted to the Division. The following drawings and design information should be submitted as applicable:

LONGITUDINAL PROFILE

Station and elevation of all the tower and terminal foundations

Station and elevation of the cable working points at all the towers and terminals

Tower heights and inclinations including type of sheave assemblies and number of sheaves

Horizontal distance and slope length, vertical rise and rope angle for each span

Cable position and deflection under maximum and minimum conditions of loading

Vertical clearances to the ground, slopes, buildings, roads, electrical power lines, and crossing of other tramway installations

Horizontal distance between adjacent tramways, roads, electrical power lines, trees, buildings, rocks, etc….

Ground clearance with cross slope of more than twenty percent (20%)

Lateral and longitudinal carrier swing clearances at the towers and sheave assemblies at horizontal position and at maximum incline and at the terminal entrance and exit locations

ROPELINE CALCULATIONS

Rope specifications and nominal breaking strength

Maximum rope tension and calculated factor of safety

Maximum rope inclination

Ropeline calculations for all the load cases, including tower loads, sheave assembly loads and sheave loads

DRAWINGS FOR MECHANICAL COMPONENTS

Assembly drawings for:

Mechanical components in the terminals, including walkways, platforms, ladders, machinery guards, etc..

Main drive, stand-by drive and/or evacuation drive machinery

Gear reducer including ratio, belt pulleys, couplings, etc..

Carrier decelerator, accelerator and transport terminal machinery as required

Carrier coupling and uncoupling terminal mechanism including grip safety switches, etc., as required

Tensioning system including mechanical stops and buffers

Tower components including sheave assemblies, lifting frames, platforms and track rope saddles and supports (bi-cable system)

Detail drawings for:

Service brake, bullwheel brake, rollback brake, etc., as required

Drive bullwheel, return bullwheel, deflection bullwheels including bullwheel retaining and rope retaining details

Bullwheel shafts and bearings

Tensioning carriage, counterweight, counterweight sheaves, tensioning cylinder, etc…

Track rope saddle (bi-cable system), sheave assemblies, sheaves, bearings, liners, cable catcher, deropement guards, derail switches, rope position switches, etc., as required

Tower and terminal carrier guides

Rope connections and rope anchorage as required

HYDRAULIC OR PNEUMATIC COMPONENTS

Hydraulic and/or pneumatic schematic for all the brake systems

Hydraulic and/or pneumatic schematic for the tensioning system

Hydraulic schematic for stand-by drive and/or evacuation drive

ELECTRICAL INSTALLATION

Electrical schematics and wiring diagrams including a listing of manufacturers, model, size, identification numbers of all the electrical systems used in the tramway installation

Drive safeties

Speed control arrangements

Overspeed control

Electrical schematics for the low voltage safety circuits

Manual and automatic stops

Tower derailment switches, rope position detector switches (if provided)

Counterweight and/or carriage travel limit switches

Carrier anti-collision system (if provided)

Grip position safety switches (if provided)

Grip force safety system (if provided)

Wind instruments (if provided)

Provisions for grounding and lightning protection

CARRIERS

Assembly drawings for:

Complete carrier and/or cabin

Carriage (if provided)

Grip

Hanger

Detail drawings for:

Grip components (Form 106 may be used for new grip submittals)

Carrier and/or cabin components

Hanger component

Carriage components (if provided)

Door closing mechanism for automatic carrier doors (if provided)

STRUCTURES

Structural drawings for:

Drive terminal

Return terminal

Typical towers

Major related structures

Foundation drawings and design calculations for:

Terminals

All towers

Major related structures

Tower column stress analysis

Foundation loadings and any restrictions or special considerations

TESTING CERTIFICATIONS

Fatigue testing information and results for grip, hanger and carrier, as required

Certification from the manufacturer that each grip has been non-destructively tested (NDT)

Certification of design for tensioning cylinder

Wire rope and/or chain test reports and certification as required

Wire rope splicing certificate

Electromagnetic (MRT) wire rope test results

Certification for end connections as required

Concrete test results

Certification for "double load" for fixed grip carrier as required

EXAMPLES OF MAJOR ALTERATIONS

The following list is intended to provide guidance in determining those changes to the tramway which are properly classified as major alterations; however, this list is not all inclusive and it must be recognized that the circumstances pertaining to a particular alteration may justify reclassification to another category.

A change in the design speed of the system.

1. Any increase beyond certified design is a major modification – a decrease is not.

A change in design capacity by changing the number of carriers, spacing of carriers, or load capacity of carriers.

1. Carriers may be added or removed to accommodate normal rope stretch or relocation in rope splice areas. If this is done within the certified design parameters it is not a modification.

2. A change in carrier spacing which results from normal operation (i.e., grip slippage) is not a modification.

3. Increasing load capacity is interpreted to mean changing the number of passengers (i.e., double chair to triple chair).

A change in the path of the rope.

1. Adding or removing midway load/unload terminal.

2. Moving a tower.

3. Change in tower height/number of towers.

4. Change in line gauge.

5. Moving a terminal is at a minimum a major modification and may be considered a relocation of the lift upon Division review.

A change in the type of brakes and/or backstops or components thereof.

1. If the specifications of the component are equivalent, then it is treated as a one for one replacement and not a major modification.

2. A change to the application mechanism, defined as the energy used to set the brake (i.e., weights to springs, springs to hydraulics, or different types of weights, springs, or hydraulics, etc.) is a major modification.

A change in structural arrangements.

1. A change to the cross arm (i.e., removing angle brace and making it self-supporting).

2. Tower.

3. Terminal support.

A change in power transmission equipment or type of prime mover or auxiliary engine.

1. A change in electric motor or internal combustion engine with equivalent specifications is treated as a one for one replacement and is not a major modification.

2. An increase or decrease in the horsepower of an electric motor or internal combustion engine.

3. Changing an AC to DC or vice versa, etc.

4. Changing an internal combustion engine to electric or vice versa is a major modification.

5. A change to the arrangement of the following power transmission equipment – gear box, fluid coupling, torque converter, V-belt drive, pulleys, U-joints, shaft couplings (i.e., fluid coupling to torque converter, V-belt to gear box, etc.)

A change in critical components.

1. A change in specifications of the critical components.

2. A change from center pole to bail chairs.

3. A change in grip models or manufacturers.

4. Adding chair bubbles, change in type of carrier (i.e., quad chair to gondola).

Substantive change to the control system logic.

1. Replacement of the control system.
2. Changing from relay logic to digital.
3. Multiple component changes within system controls.