

Commissioned Inspection Rules for Traction Household Elevators Study on the Compilation of Local Standards in Hubei

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1 Background

With the continuous improvement of China's economic level and the rapid development of urbanization, people's demand for comfort in domestic life is increasing day by day. More and more domestic elevators appear in private houses represented by villas. According to reports^[1], in 2015, the annual output of domestic elevators has reached 80 thousand ~ 100 thousand units, the annual sales is about 10 thousand units. In addition, due to the future economic development and aging of the population, domestic elevators are predicted to be popular and to achieve home audio-visual applications, so it has a very broad market prospect.

A household elevator is different from a general public passenger elevator. It is a private elevator for a single family. It has a non-public character. The main features are: low lift domestic travel, the lifting height is no more than 12m; the load is small, the highest rated load is 400kg; slow speed, rated speed is less than 0.4 m/s, the rated speed of car door is less than 0.3 m/s; it can be designed in a shallow pit, slim, even the bottomless pit, wells^[2]. According to the difference of driving mode, the current market of household elevators mainly include three types that is screw type, hydraulic and traction type^[3]. The screw type flexible structure, high safety, but the noise is large, low speed and travel; hydraulic noise is small, but there

are more serious pollution, high maintenance costs and lack of traction; but the traction type is convenient for installation and maintenance, speed can be up to 0.3 ~ 0.4 m/s, almost has no noise, low energy consumption, so it is used more widely in the field of household elevator.

In face of the great growth of the traction type household elevator and the great potential of its application, more and more attention has been paid to its safety test. However, according to the provisions of the revised "Special equipment safety supervision regulations", the household elevator is not in the scope of the statutory mandatory inspection^[4]. There are also no inspection requirements for household elevator through no national standards, industry standards and local standards. Therefore, the research establishment is applicable to the traction type of household elevator inspection rules of the province, also is of great significance to further standardize the entrusted inspection work in Hubei Province, improve the quality and commissioned the inspection to ensure safe operation of the elevator. At the same time, it also provides some reference for domestic elevator inspection in other place.

2 General Situation of Establishment

2.1 Follow the Basic Principles

Abstract: With the popularization and application of the traction type household elevator, the social demand for its commissioned examination has also surged. Because of the lack of relevant inspection standards, it is urgent to formulate the rules for inspection. This paper expounds the local standards of Hubei province establishment background, working process and the basic principle, the main technical content standards, studies the key technical requirements, provides a local, normative and practical reference for the inspection work instruction for traction type household elevator.

Key word: Traction household elevator; Inspection rule; Local standard; Hubei province; Establishment

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The establishment of the standard is the basic principle to guarantee the safety of traction home elevator, according to the requirements of GB/T21739-2008 "home elevator manufacturing and installation specification"^[5], GB7588-2003 "elevator manufacturing and installation safety standards"^[6], In consideration of the present situation overall development of the industry, and fully take into account of the actual use of the development of the industry status quo at home and abroad, the overall technical characteristics, household elevator brands and Hubei household elevator, achieve the preparation of comprehensive content, objectivity, innovation and practicality of unity.

2.2 The Main Work Process

As a standard preparation plan for Hubei Quality Supervision Bureau in 2017, the standard compilation work is mainly divided into four stages:

The first stage is data consolidation. Collect domestic and international technical standards, safety standards and research progress of domestic elevator manufacturing, installation and inspection. Such as series of GB/T21739-2008, GB7588-2003, Australia and New Zealand AS1735.18, the United States ASME A17 and other standards, journal papers and patent documents which are related to household elevator, provide reference for the preparation of standards^[7].

The second stage is through the on-site investigation of domestic elevator manufacturers, installation units, the use of units and inspection institutions, in order to determine the scope of application of this standard. After soliciting the opinions of the engineers and technicians involved in the design, manufacture, installation, use and inspection, a research report is formed and the preliminary draft is discussed. Finally, an opinion draft is formed.

The third stage is to organize engineering standards representatives of manufacturing and inspection unit to have

symposia in order to have in-depth discussion for comments on the draft revised, through amending the adoption of proposed views and explaining the comments which are not adopted, finally form of a standard validation draft.

The fourth stage is to have a standard validation draft review meeting which invite experts and scholars in the field of quality inspection departments, elevator industry, standard information, scientific research institutions and so on, through implementation and improvement according to the recommendations and suggestions of the meeting, finally apply to the standard management departments for approval and publishing.

3 The Main Content Points

3.1 The Main Contents of the Preparation

The main contents of standard preparation including the range of inspection, normative files, terms and definitions, test items and requirements, inspection and assessment categories and inspection reports of traction household elevator, the test items include well and pit, elevator cab, cab door and landing door, safety components, electrical equipment and electrical protection, the test that performance of the whole system and identification. The main content of the framework is shown in Figure 1^[8].

3.2 Technical Notes

Scope of application of Standard compilation: apply to the commissioned inspection of traction type household elevator's installation and maintenance, the traction type household elevator shall meet the following conditions: 1) for single family use; 2) available for use or not use wheelchair use; 3) between the fixed station, the car along track angle of not more than 15 degrees tilt and vertical direction; 4) is suspended by a steel wire rope, steel; 5) traction electric drive; 6) with independent wells.

Standard of wells requirements: the weight (or cabin) guidance travel guide should not be less than 0.10m when the weight (or cabin) full pressure in the buffer; the home elevator without car door, the width when open the door and each side with the range of 50mm, any concave well wall the inner surface of the protruding and should not be greater than 3mm; for household elevator car door, the well wall should form a vertical surface and the door sill is directly connected to the lock area height should be not less than 1/2 plus 50mm, the net width should not be less than the entrance and on both sides of the road between wells plus 25mm; the wall and the car door frame and a door sill, the horizontal distance should not be greater than 0.15m.

The standard of pit requirement: if the elevator is equipped with mechanical stop device, a switch should be used to monitor the mechanical device is in the working position, if the machine is not reset, electrical safety device should be able to prevent the elevator starting; when the cab is full pressure in the buffer, between the cab at the bottom of the lowest parts with the highest parts of pit vertical distance not less than 0.1M, When the mechanical stopping device moves, the pit should have enough space to accommodate a not less than 0.50m * 0.60m * 1.0m cuboid.

The standard of the cab: the cab entrance clear height should not be less than 2.0m, the cab entrance net width should not be less than 0.6m, the cab clear height should not be less than 2.0 m, the cab net width should not be less than 0.6 m; the horizontal distance between the outer edge of the cab roof and the wall of well should be more than 0.3m. Except for the operating device and the corresponding operated device, cab top guardrail should be installed with the corresponding control device, horizontal movement gap between the moving parts and fixed parts should be not less than 20mm; the cab and counterweight

(or balance weight) between the horizontal distance should not be less than 50mm.

The standard of the requirements of cab door and landing door: layer after the door is closed, the

gap between the door and the door frame and sill should not be greater than 6mm; horizontal distance of the cab sill and door sill should not be less than 10mm, but the cab door power operated, should not be more than 35mm,

for manual the cab door, should not be greater than 25mm; if the cab door of the home elevator is not set, protective devices should be installed in the cab.

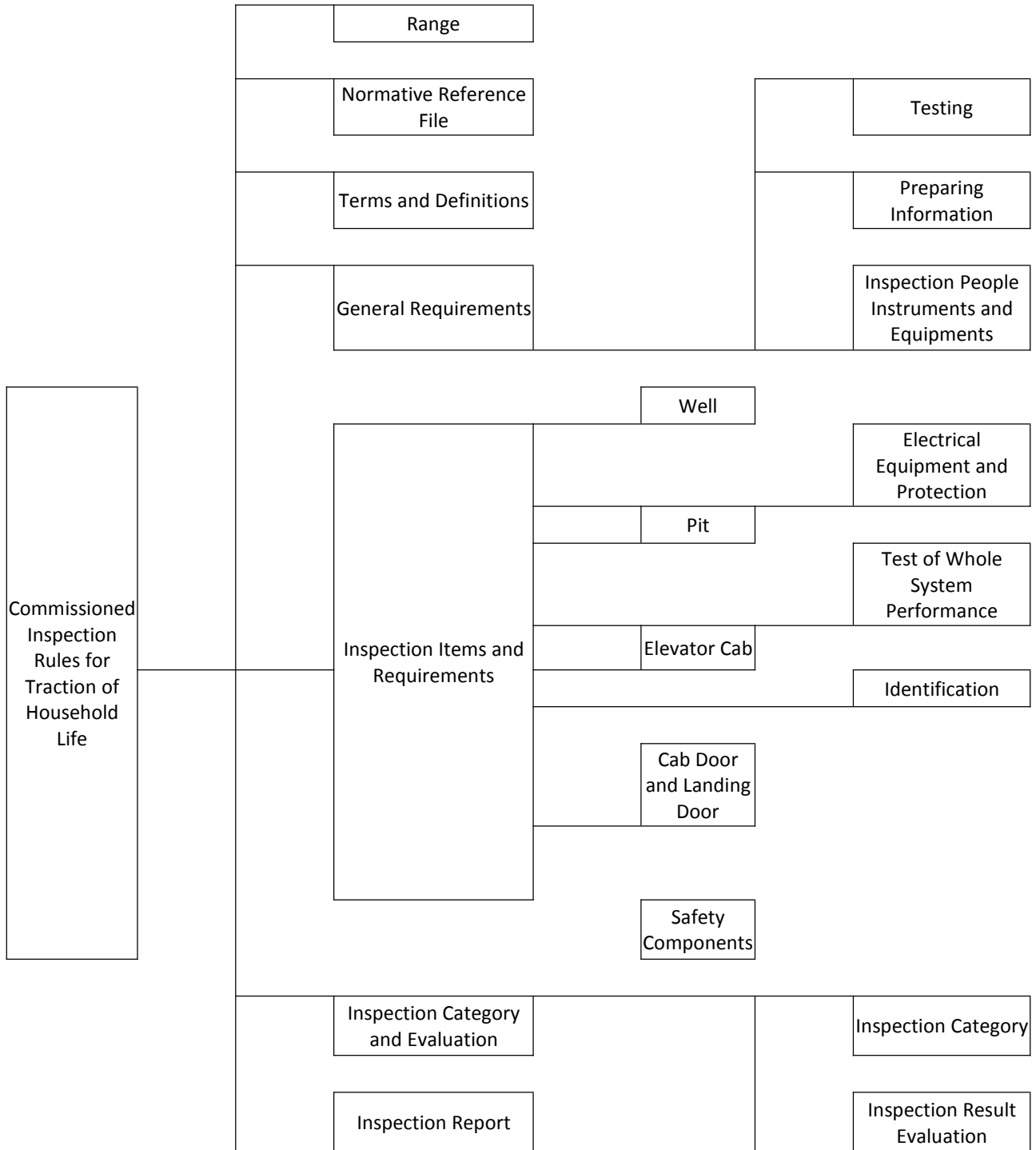


Figure 1 Main Content of the Framework Map Components: machine

Standard for safety requirements for

-electric brake device should be set, the mechanical

part of all involved in the brake should be divided into two assembly design;

the operating force is required when move upward with the rated load cab is greater than 400N, electric operation device should be set outside the well ,the safety clamp; speed should be mechanical triggered through governor, not be triggered by the devices of electrical, hydraulic or gas; the buffer should be set at the bottom limit position of cab and counterweight stroke; the limit switch should be set as close as possible to the position of the cab when terminal station works without misoperation and dangerous; rotating parts which are formed by traction wheel, pulley, governor and tension sheave etc. and the wire rope, protection device shall be set up; the elevator cab and counterweight should hang at least two independent suspension rope, the nominal diameter of wire rope should not be less than 6mm, the wire rope shall be replaced when the loss of diameter exceeds 10%, kink or deformation or decay.

The standard has made requirements of electrical equipment and electrical protection ,the electric motor which is supplied by AC or DC power directly, the power must be cut off by two independent contactors, the contacts should be connected in series in a power supply circuit; at least two separate electrical devices work when cut off brake current; the emergency

electric operation switch should be set up to meet the electrical safety device requirements, the switch and the control button should be set outside of the well where can be directly observed; emergency lighting power supply that automatic recharging and emergency alarm device should be installed^[9].

Standards for the preparation of the overall performance test requirements: cab should maintain a flat layer state without slip in condition of loading to 125% rated load; when pressure in the buffer and the elevator traction machine according to the upward direction of rotation, it shall not be possible to enhance the empty cab; the cab is equipped with rated load or empty load, when go down through the speed of maintenance, governor and safety clamp action should be reliable at the time of having linkage test ; when the cab run down with rated speed which carrying 125% of rated load, brake should stop the traction machine working and make the cab stop reliably, cab deceleration should not exceed the speed when safety clamp or the cab hit the buffers. Static tests are carried on the carrying capacity of 150%, permanent deformation shall not occur.

3.3 Process and Determination Instructions

The standard has drawn up the inspection procedure of the traction type household elevator, which is divided into five stages: self-inspection, data review, on-site commissioning, inspection advice and report, as shown in Figure 2^[10].

Results shall be deemed as qualified if all the commissioning items are in conformity with the requirements and the inspection results. If the project does not meet the test items, but the commissioned unit or entrusted personal have supervision and rectification, it can be found qualified if the entrusted inspection units on-site review which rectify the original that does not meet the test items, meet items after the inspection conclusion.

If there is any project which fails to meet the requirements of the commissioning examination, and if the installation or maintenance unit fails to rectify the project which is not in conformity with the commissioning examination, the examination result shall be deemed to be unqualified. If the project does not conform to the entrusted inspection, and does not conform to the entrusted examination, the project shall be deemed to be unqualified after the rectification has been made by the installation or maintenance unit.

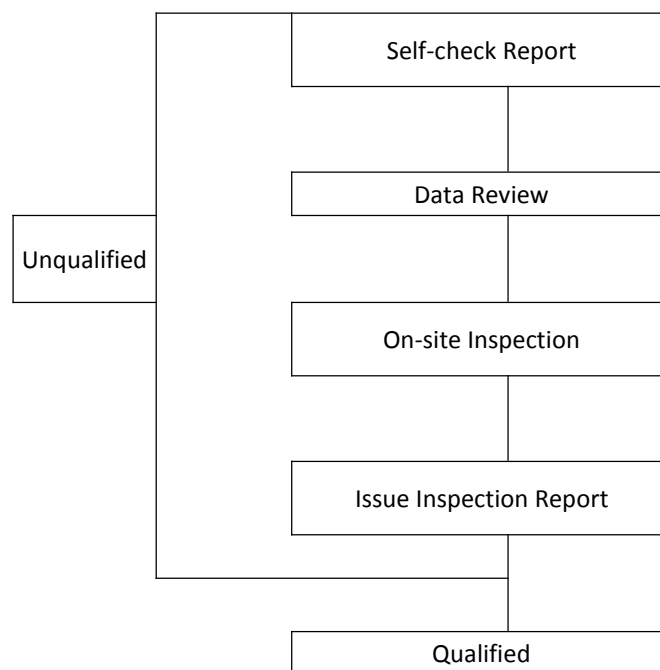


Figure 2 Working Chart of Commissioning Inspection

4 Conclusion

The establishment of the standard, is an effective supplement to the current national standards, industry standards, local standards and Safety specifications, not only for the traction type household elevator installation and inspection personnel in determining inspection procedures, method and inspection, provides guidelines practical and normative, to meet the needs of local inspection improve the quality of industry inspection and technical level, but also has a positive role in promoting. The research and implementation of this standard is expected to reduce the safety accidents of household elevators, protect the family's economic safety, and promote the healthy development of the family elevator industry.

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