DEPARTMENT OF COMMERCE AND LABOR

CIRCULAR

OF THE

BUREAU OF STANDARDS

S. W. STRATTON, DIRECTOR

No. 13

STANDARD SPECIFICATIONS FOR THE PURCHASE OF INCANDESCENT ELECTRIC LAMPS

[4th Edition]
Issued May 10, 1910

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INTRODUCTION

An informal conference called by the engineers of the various Government Departments and attended by them, by representatives of the manufacturers of incandescent lamps in the United States, and by representatives of the Bureau of Standards and the Electrical Testing Laboratories, was held in Washington, February 25 to 27, 1907, at which specifications for the purchase of electric incandescent lamps were adopted. At a meeting held at the Bureau of Standards, May 13, 1908, various modifications were adopted, and at a third conference at the Bureau, May 14, 1909, the specifications were again revised and Gem, Tantalum, and Tungsten lamps were included in the specifications and separate schedules prepared for each type of lamp.

[1] Superseding edition of July 1, 1909.

The fourth annual conference was held in Washington April 28, 1910, and in addition to revising all the general specifications and all the lamp schedules, a radical change was made in the method of rating carbon-filament lamps, putting them on the same basis as the metallized filament, tantalum, and tungsten lamps, namely, rating them by watts and three voltages instead of candlepower, voltage, and watts per candle. It is believed that this change will prove to be advantageous both to the manufacturers and to the users of lamps. In order to facilitate ordering lamps in the immediate future, before the public has become familiar with the new ratings, an explanatory statement and a comparison of old and new ratings are given in this circular at the end of the specifications.

Criticisms and suggestions concerning the specifications and lamp ratings are invited from both manufacturers and the users of lamps. All such suggestions will be carefully considered when the specifications are again revised.

Although these specifications were prepared primarily for the use of the Departments of the Government in purchasing incandescent lamps, it seemed desirable, both on account of the representative character of the conferences and of the thoroughness with which the subject has been studied and discussed, that the results of the conferences should be available to the general public.

The Bureau of Standards indorses these specifications and has therefore published them for distribution. In circulating them freely, however, it desires to call attention to the necessity of extreme caution in the application of the tests described in the specifications. Only those thoroughly instructed in the art of lamp manufacture and in the science of photometry should undertake to determine upon the acceptability of lamps under the terms of the specifications.

S. W. Stratton,
Director.

Approved:

Secretary.

STANDARD SPECIFICATIONS FOR THE PURCHASE OF INCANDESCENT ELECTRIC LAMPS

Specifications for the purchase of incandescent lamps by..... ....., hereinafter called the party of the first part, from ....., hereinafter called the party of the second part, during the period from..... to.....

The complete specifications for incandescent electric lamps which the party of the second part proposes to furnish to the party of the first part under specifications shall consist of the "General Specifications" given below and the schedules attached thereto.

I. GENERAL SPECIFICATIONS

1. SAMPLES

To show construction, the party of the second part must, if requested, submit two samples of each kind, size, or type of lamp proposed to be furnished to the party of the first part. All lamps mentioned herein, to be hereafter supplied on any contract between the parties to these specifications during the period specified must conform to the samples submitted in shape of bulb, mechanical construction, and type of filament, and no departure from the samples will be permitted without the written consent of the party of the first part (excepting where the individual schedules so provide).

2. GUARANTY

Incandescent lamps to be furnished under this contract shall be new lamps and shall be guaranteed to be in accordance with the following specifications.

3. GENERAL CONDITIONS

The provisions of these specifications shall be binding upon all lamps specifically mentioned herein, and upon no other lamps, except by mutual written agreement.

These specifications shall not apply to any frosted or colored lamps, or to lamps other than those with the usual clear glass bulbs, unless otherwise specifically included. Frosted lamps shall be represented in initial tests, inspection, and life tests by clear lamps.

All tests shall be made in a competent and expert engineering manner at the expense of the party of the first part, excepting that when initial tests and inspections are made at the factory the party of the second part will be required to supply the necessary equipment, assistance, current, and facilities for making such initial tests and inspection. The party of the second part, or his agent, shall have the privilege of witnessing and verifying all tests of his lamps made hereunder, and shall also be privileged to obtain copies of the tests of his lamps and have access to the records of such tests at all reasonable times.

4. DEFINITIONS AND STANDARDS

The values of the units in these specifications are those which were in force on January 1, 1910.

Unit of candlepower.—The unit of candlepower shall be the international unit as maintained by the Bureau of Standards at Washington, D. C.

Photometric measure.—The basis of comparison for all lamps shall be mean spherical candlepower. The candlepower referred to in these specifications for each class of lamp shall be the mean horizontal candlepower based on reduction factors given in Tables 3 of the schedules for the several classes of lamps.

For lamps having filaments giving a different ratio of mean spherical to mean horizontal candlepower, the horizontal candlepower measurement will be corrected by a reduction factor determined by the Bureau of Standards, or other authority mutually agreed upon, and the test life performances shall be equivalent to those given in Tables 3 of the schedules.

Test quantity.—The test quantity shall consist of the percentages shown in Table 1 for each lot of lamps inspected, and in no case shall be less than 10 lamps.

The inspector may select as a lot of lamps to be inspected any individual package or any group of packages containing one or more types of lamps of any one schedule.

TABLE 1

Total quantity of lamps in any lot selected for inspection	Number necessary for test quantity	
	When test is made at factory of manufacturer	When test is made elsewhere
	Per cent	Per cent
Under 1000	20	40
1000 to 1999	15	30
2000 to 4999	12	24
5000 and over	10	20

5. METHOD OF TEST

From each lot of lamps there will be selected at random the test quantity for the purpose of determining the mechanical and physical characteristics of the lamps, the individual limits of candlepower and watts, and

finally the life and candlepower maintenance. The lamps shall be selected proportionately from the several packages composing the lot, and shall be known as the test lamps.

6. BULBS

All bulbs shall be uniform in size and shape, clear, clean, and free from flaws and blemishes.

7. BASES

All lamps, unless otherwise specified, shall be made with moisture-proof, standard Edison screw bases, fitted with glass buttons, and when bases have extended skirts same shall be insulated from the shell. The bases shall be firmly and accurately fitted to the bulb with moisture-proof cement. The shells of the bases shall be of good quality brass.

8. FILAMENTS

The filaments must be uniform and free from imperfections, spots, and discolorations, and must be symmetrically disposed in the bulbs.

9. LEADING-IN WIRES

Leading-in wires must be fused into the glass with the joints between the copper and platinum wires bedded well within the glass, and must be straight, well separated, and securely soldered to the base and cap, without excess of solder. The threads of the base must be free from solder.

10. VACUUM

The lamps must have first-class vacuum, showing the characteristic glow of good vacuum when tested on an induction coil.

11. MARKING

One or more printed labels, showing rating and the manufacturer's name, or trade-mark, shall be placed on the bulb or the base of each lamp.

12. MECHANICAL AND PHYSICAL CHARACTERISTICS

The lamps must be well made and free from all defects and imperfections, so as to meet satisfactorily the conditions of the lighting service.

All lamps shall conform to the manufacturer's standard shapes and sizes of bulbs, to the manufacturer's standard forms of filament, and the manufacturer's standard ratings.

13. REJECTION FOR DEFECTS

(*a*) The test quantity of lamps selected from any lot of lamps will be inspected for physical defects, and when so inspected if the number of lamps showing physical defects incompatible with good workmanship, good service, or with any clause of these specifications, is equal to, or in excess of, the percentages given in Tables 2 of their respective schedules, the entire lot of

lamps from which the test quantity was selected may be rejected without further test, unless the individual schedules provide otherwise.

(*b*) If any quantity of lamps selected as a lot to be inspected is acceptable as a whole in accordance with paragraph (*a*) of this section, but the test lamps indicate an excessive number of defective lamps in any individual package or packages of 200 or more lamps each, or any group of packages aggregating 200 or more lamps, these packages may be withdrawn and reinspected as individual lots in accordance with Tables 1 and 2.

14. INITIAL LIMITS

(*a*) Lamps shall be tested at rated voltage, amperes, or candlepower as shown in their respective schedules, and when so tested if the number of lamps in any lot falling beyond the limits given in Tables 3 of their respective schedules equals or exceeds the percentage of test quantity necessary for rejection as given in Tables 2 of their respective schedules, the entire lot of lamps may be rejected, unless the individual schedules provide otherwise.

(*b*) If any quantity of lamps selected as a lot to be tested is acceptable as a whole in accordance with paragraph (*a*) of this section, but the test lamps indicate an excessive number of lamps in any individual package or packages of 200 or more lamps each, or a group of packages aggregating 200 or more lamps, which lie without the prescribed limits given in Tables 3 of their respective schedules, these packages may be withdrawn and reinspected as individual lots in accordance with Tables 1 and 2.

15. LIFE AND CANDLEPOWER MAINTENANCE

Life tests shall be made as follows: For the purpose of selecting lamps for life test, accepted packages containing 100 lamps or less may be grouped to aggregate not more than 250 lamps. From such groups and from accepted standard packages containing more than 100 lamps each, at least one sample shall be selected which approximates most closely to the average of the test quantity. The lamp thus selected will be designated as the life-test lamp, and will be subjected to a life test. A second or duplicate lamp may be reserved to replace this test lamp in case of accidental breakage or damage during life test. The test lamps shall be rated and operated on life test as shown in their respective schedules.

The life-test lamp shall be operated for candlepower performance at the voltage corresponding to an initial specific consumption or voltage as given in Tables 3 of the schedules.

During life test, carbon filament and metallized carbon filament lamps shall be read for candlepower and watts at the marked voltage at approximately fifty hours and at least every one hundred hours thereafter until the candlepower shall have fallen 20 per cent below the initial candlepower or until the lamp breaks if within that period. To determine the change in candlepower of tantalum and tungsten filament lamps, 10 per cent only of the life-test lamps shall be read for candlepower and watts at the marked voltages at approximately fifty hours, and at least every one hundred hours thereafter until the average candlepower shall have fallen 20 per cent below

the initial candlepower or until the lamp breaks if within that period. The remaining 90 per cent of the life-test lamps are to burn without removing from the racks until the average candlepower of the 10 per cent to be read shall have fallen to 80 per cent of their initial candlepower, when the remaining 90 per cent of the life-test lamps shall be read for candlepower and watts at the marked voltage and at least every one hundred hours thereafter until the candlepower of each lamp shall have fallen 20 per cent below the initial candlepower or until the lamp breaks if within that period.

The number of hours each lamp burns until the candlepower has decreased to 80 per cent of its initial value, or until the lamp breaks if within that period, is known as the test life.

The average candlepower of lamps during test life shall not be less than 91 per cent of their initial candlepower.

In computing the results of life test of any number of lamps the average candlepower shall be the arithmetical mean of the value for the individual lamps of any type of the number tested.

Lamps selected for the life test, which for any reason do not start on such test, shall be replaced by others.

Lamps which are accidentally broken, but not burned out on test, shall not be counted to diminish the average performance.

In case any test lamps are broken or damaged before the life test is completed, the average performance of all lamps of the same class tested under the same contract shall be assigned to the package represented.

On all life tests for determining test life and candlepower each group or package which will be affected by the results of test shall have at least one lamp on such test.

Accurate recording voltmeter records shall be obtained during the test on lamps to show the average variation on the circuit.

Variations of voltage are not to exceed one-quarter of 1 per cent above and below the test voltage.

When lamps are so tested, the average test life shall be at least as great as the values given in Tables 3 of their respective schedules.

16. REJECTIONS AND PENALTIES

The failure of the lamps to conform to the specifications as to mechanical and physical characteristics, or to initial limits, may cause their rejection.

The failure of any lot of lamps, provided such lot is represented by at least 4 lamps on life test, to give an average test-life value equal to the test-life value specified in Tables 3 of their respective schedules, may cause their rejection, and shall permit the cancellation of all orders for this type of lamp.

The contract for lamps furnished under these specifications may be canceled at any time during its life if it is found that the ratio of the actual test-life values to the guaranteed test-life values determined up to that date, inclusive, on the lamps delivered under such contract, is less than 90 per cent.

Lamps which have not been used and are rejected under the terms of these specifications will be returned to the party of the second part at his expense, and no payment will be made therefor.

All lamps placed in service shall be considered as accepted.

Prompt notice will be given the party of the second part of the results of lamp tests.

The foregoing paragraphs provide specifications that are general to carbon, metallized carbon, tantalum, and tungsten filament lamps, and when accompanied by the schedule for any of these four classes of lamps form the complete specifications for that class of lamps.

Signed by.....:
(Party of the second part)

Accepted by.....
(Party of the first part)

Date:.....

II. LAMP SCHEDULES

SCHEDULE C.—CARBON FILAMENT LAMPS

This schedule applies to carbon filament, large, regular, clear lamps of from 100 to 130 volts and from 200 to 260 volts, for multiple burning, and with the "General Specifications" for incandescent electric lamps forms complete specifications for lamps of such wattages as are specifically mentioned herein.

TABLE C2

Test Quantity and Percentage for Rejection

Total quantity of lamps in any lot selected for inspection	Percentage of test quantity necessary for rejection of the lot
	Per cent
Under 1000	10
1000 to 1999	8
2000 to 4999	6
5000 and over	5

TABLE C3

Initial Limits, Rating, and Performance

(*a*) *Values for clear, oval-anchored, 100 to 130-volt standard carbon filament lamps for multiple burning, when tested at rated top voltage.*

Rated watts per lamp	Initial candlepower at top voltage	Initial limits at top voltage				Average performance
		Individual candlepower limits (above and below)	Mean candle power limits (above and below)	Individual watt limits (above and below)	Mean watt limits (above and below)	Test life, in hours, to 20% drop in cp at 3.70 w. p. m. s. c.
		Candlepower	Candlepower	Per cent	Per cent	
20	4.8	1	0.6	12	6	300
25	8.1	1	.6	10	5	300
30	9.3	1	.6	10	5	350
		Per cent	Per cent			
50	16.8	7.5	2.5	5.5	2.5	450
60	20.2	7.5	2.5	5.5	2.5	420
100	33.6	9.0	3.0	6.0	3.0	430
120	40.4	9.0	3.0	6.0	3.0	400

(*b*) *Values for clear, double oval-anchored, 200 to 260-volt standard carbon filament lamps for multiple burning when tested at rated voltage.*

		Candlepower	Candlepower	Per cent	Per cent	
35	8.0	2	1	15	7.5	120
		Per Cent	Per cent			
60	16.3	15	7.5	12	6	160
120	32.5	15	7.5	12	6	140

The spherical reduction factor which applies to the above table is 82.5 per cent.

NOTE.—*Excepted voltages:* It is recommended that every effort be made to avoid ordering lamps of actual rated voltages 105 and below, 109, 110 and 111, 121 and above, and from 218 to 222, inclusive.

(*c*) *Values for excepted voltages.*—Lamps of the above types, of voltages 105 and below, 110, 121 and above, and also 220, may have double the limits of variation in the initial limits specified for their respective classes.

The limits given in Table C3 can be secured on lamps ordered to be of these excepted voltages at the option of the party of the first part, provided that the party of the second part is allowed to furnish a range of voltage equivalent to the double limits. The double limits in the 110-volt class would correspond to 1 volt above and 1 volt below the voltage ordered and in the 220-volt class to 2 volts above and 2 volts below the voltage ordered.

For lamps between 120 and 125 volts, inclusive, the test-life values shall be 95 per cent of those given in Table C3, and for lamps between 126

and 130 volts, inclusive, the test-life values shall be 90 per cent of those given in Table C3.

(*d*) *Values for clear round bulb and tubular types of carbon filament lamps for multiple burning, when tested at rated voltage.*—The individual limits for clear round bulb type and tubular clear multiple burning lamps of 100 to 130 volts and 200 to 260 volts shall be double the limits as given in Table C3, paragraphs (*a*) and (*b*), for the corresponding wattages. The double limits shall be as explained in paragraph (*c*), excepting that for the excepted voltages as given in paragraph (*c*) it shall not be construed to double the double limits. The range of voltages corresponding to the double limits shall be, for the 110-volt lamps, 1 volt above and 1 volt below the voltage ordered, and for the 220-volt lamps, 2 volts above and 2 volts below the voltage ordered.

The average test life for round bulb and tubular lamps shall be 50 per cent of the values given in paragraphs (*a*) and (*b*) for the corresponding wattages.

(*e*) Lamps of the above types shall burn on test in one horizontal position at a voltage corresponding to an initial consumption of 3.70 watts per mean spherical candle, without excessive drooping of the filament.

(*f*) The label on the lamp shall show the nominal total watts and voltage.

SCHEDULE C RY.—RAILWAY LAMPS

This schedule applies to carbon filament, large, regular, clear lamps for street railway series burning, and, with the "General Specifications" for incandescent electric lamps, forms complete specifications for lamps of such wattages as are specifically mentioned herein.

TABLE C RY 2

Test Quantity and Percentage for Rejection

Total quantity of lamps in any lot selected for inspection	Percentage of test quantity necessary for rejection of the lot
	Per cent
Under 1000	10
1000 to 1999	8
2000 to 4999	6
5000 and over	5

INITIAL LIMITS, RATING, AND PERFORMANCE

(*a*) *Values for clear, oval-anchored, 100 to 130-volt standard carbon filament lamps for series-burning railway service when tested at initial candle-power.*—These lamps shall be rated in the following voltage groups:

105 volts for use 5 in series on 525 volts.
110 volts for use 5 in series on 550 volts.
115 volts for use 5 in series on 575 volts.
120 volts for use 5 in series on 600 volts.
125 volts for use 5 in series on 625 volts.

Each voltage group shall embrace a range in amperes 5 per cent above and 5 per cent below the nominal ampere value obtained by dividing the product of the initial candlepower and actual initial watts per mean horizontal candlepower by the voltage of the group. The lamps will be marked and packed in 0.01-ampere steps through this range.

When the value of the annual supply for any voltage group and wattage is not over $1600, the party of the second part shall supply lamps of one of the 0.01-ampere steps.

When the value of the annual supply for any voltage group and wattage exceeds $1600, the party of the second part shall have the privilege of supplying at least two of the 0.01-ampere steps.

Each 0.01-ampere step shall be within the limits shown in Table C Ry 3.

TABLE C RY 3

Tested at Initial Candlepower

Rated watts per lamp	Initial candlepower	Initial individual limits			Initial average limits			Average performance
		Ampere limits (above and below)	Watt limits (above and below)	Volt limits (above and below)	Ampere limits (above and below)	Watt limits (above and below)	Volt limits (above and below)	Test life, in hours, to 20% drop in cp at 3.70 w. p. m. s. c.
		Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	
42	10.2	3	6.5	4	1.0	3.0	2	450
64	16.3	2	5.5	4	0.7	2.5	2	400
114	32.5	3	6.5	4	1.0	3.0	2	400

The spherical reduction factor which applies to the above table is 82.5 per cent.

(*b*) If the party of the second part so elects, the following table of initial limits may be substituted for Table C Ry 3:

TABLE C RY 3-A

Tested at Rated Amperes

Rated watts per lamp	Initial candlepower	Individual limits		Average limits		Average performance
		Candlepower limits (above and below)	Watt limits (above and below)	Candlepower limits (above and below)	Watt limits (above and below)	Test life, in hours, to 20% drop in cp at 3.70 w. p. m. s. c.
		Per cent	Per cent	Per cent	Per cent	
42	10.2	16	6.5	5.3	3.0	450
64	16.3	12	5.5	4.0	2.5	400
114	32.5	16	6.5	5.3	3.0	400

The spherical reduction factor which applies to the above table is 82.5 per cent.

(*c*) For the 105-volt group and the 125-volt group the limits of variation in the initial limits shall be double those given in Tables C Ry 3 or 3–A.

For lamps between 120 and 125 volts, inclusive, the test-life values shall be 95 per cent of those given in Tables C Ry 3 or 3–A, and for lamps between 126 and 130 volts, inclusive, the test-life values shall be 90 per cent of those given in Tables C Ry 3 or 3–A.

(*d*) Values for clear, round-bulb and tubular types of carbon-filament lamps for street-railway series burning when tested at initial candlepower or at rated amperes.

The individual limits for clear, round-bulb type and clear, tubular-type series burning lamps of 100 to 130 volts shall be double the limits as given in paragraphs (*a*) and (*b*) for the corresponding wattages, excepting that for the excepted voltages as given in paragraph (*c*), it shall not be construed to double the double limits.

The average test life for round-bulb and tubular lamps shall be 50 per cent of the values given in paragraphs (*a*) and (*b*) for the corresponding wattages.

(*e*) Lamps of the above type shall burn on life test in one horizontal position at a voltage corresponding to an initial consumption of 3.70 watts per mean spherical candle, without excessive drooping of the filaments.

(*f*) The labels on the lamps shall show the nominal total watts and the lamp voltage, or the voltage of the circuit on which a stated number of lamps are to burn in series.

SCHEDULE G.—METALLIZED CARBON FILAMENT LAMPS

This schedule applies to metallized carbon filament, or gem, large, clear lamps of from 100 to 130 volts for multiple burning, and with the "General Specifications" for incandescent electric lamps forms complete specifications for lamps of such wattages as are specifically mentioned herein.

TABLE G2

Test Quantity and Percentage for Rejection

Total quantity of lamps in any lot selected for inspection	Percentage of test quantity necessary for rejection of the lot
	Per cent
Under 1000	12
1000 to 1999	10
2000 to 4999	9
5000 and over	8

TABLE G3

Initial Limits, Rating, and Performance

(*a*) *Values for clear, oval-anchored, 100 to 130-volt standard metallized carbon filament, or gem, lamps for multiple burning when tested at rated top voltage.*

Rated watts per lamp	Initial candlepower at top voltage	Initial limits at top voltage		Average performance
		Individual candlepower limits (above and below)	Individual total watt limits (above and below)	Test life, in hours, to 20% drop in cp at 2.98 w. p. m. s. c.
		Per cent	Per cent	
40	15.6	7.5	7	400
50	20.0	7.5	7	450
80	32.5	7.5	7	500

The spherical reduction factor which applies to the above table is 82.5 per cent.

(*b*) The party of the second part will be allowed the privilege of shipping to the party of the first part a range of 2 volts (either 1 volt above or 1 volt below) in addition to the voltage ordered if the annual requirement of the party of the first part for Schedule G lamps is valued in excess of $1600 and a range of 3 volts if the annual requirement of the party of the second part for Schedule G lamps is valued in excess of $4000.

(*c*) Lamps of the above types shall burn on test in one horizontal position at a voltage corresponding to an initial consumption of 2.98 watts per mean spherical candle without excessive drooping of the filament.

(*d*) The labels on the lamps shall show the nominal total watts and voltage.

SCHEDULE Ta.—TANTALUM LAMPS

This schedule applies to tantalum filament, large, clear lamps of from 100 to 125 volts for multiple burning, and with the "General Specifications" for incandescent electric lamps forms complete specifications for lamps of such wattages as are specifically mentioned herein.

TABLE Ta2

Test Quantity and Percentage for Rejection

Total quantity of lamps in any lot selected for inspection	Percentage of test quantity necessary for rejection of the lot
	Per cent
Under 1000	12
1000 to 1999	10
2000 to 4999	9
5000 and over	8

TABLE Ta3

Limits, Rating, and Life Performance

(*a*) *Values for clear 100 to 125-volt standard tantalum filament lamps for multiple burning when tested at rated top voltage.*

Rated watts per lamp	Initial candlepower at top voltage	Initial limits at top voltage		Average performance
		Individual candlepower limits (above and below)	Individual watt limits (above and below)	Test life, in hours, on direct current, to 20% drop in cp when tested at labeled top voltage
		Per cent	Per cent	
25	12.7	12	8	1000
40	22.3	12	8	800
50	27.9	12	8	800
80	44.6	12	8	600

The spherical reduction factor which applies to the above table is 77 per cent.

(*b*) The party of the second part will be allowed the privilege of shipping to the party of the first part a range of 2 volts if the annual requirement of the party of the first part for the Schedule Ta lamps is valued in excess of $1600 and a range of 3 volts if the annual requirement of the party of the second part for Schedule Ta lamps is valued in excess of $4000.

(*c*) Lamps of the above types shall be operated on life test on direct current at labeled top voltage.

(*d*) The labels on the lamps shall show the nominal total watts and voltage.

SCHEDULE T.—TUNGSTEN AND MAZDA LAMPS

This schedule applies to tungsten filament and Mazda, large, clear lamps of from 100 to 125 volts, for multiple burning, and with the "General specifications" for incandescent electric lamps forms complete specifications for lamps of such wattages as are specifically mentioned herein.

TABLE T2

Test Quantity and Percentage for Rejection

Total quantity of lamps in any lot selected for inspection	Percentage of test quantity necessary for rejection of the lot
	Per cent
Under 1000	16
1000 to 1999	14
2000 to 4999	12
5000 and over	10

TABLE T3

Limits, Rating, and Life Performance

(*a*) *Values for clear 100 to 125-volt tungsten filament and Mazda lamps for multiple burning when tested at rated top voltage.*

Rated watts per lamp	Initial watts per candle-power	Initial limits at top voltage		Average performance
		Individual watts per mean horizontal candle-power (maximum only)	Individual total watt limits	Test life period, in hours, to 20% drop in cp when tested at labeled top voltage
		Per cent		
25	1.31	8.5	20–34	1000
40	1.23	8.5	34–49	1000
60	1.18	8.5	50–72	1000
100	1.18	8.5	85–120	1000
150	1.18	8.5	125–175	1000
250	1.13	8.5	200–300	1000

The spherical reduction factor which applies to the above table is 78 per cent.

(*b*) *Shipping range and voltage.*—The party of the second part will be allowed the privilege of shipping to the party of the first part a range of 2 volts if the annual requirements of the party of the first part for Schedule T lamps are valued at less than $800, a range of 3 volts if the annual requirements for Schedule T lamps are valued in excess of $800 and less than $7500, and a range of 4 volts if the annual requirements are valued in excess of $7500.

(*c*) Lamps of the above types shall be operated on life test at labeled top voltage, and shall burn in a vertical position, tip downward.

All lamps burned out during life test must have burned out with current on them and without shock to be included in the test and be counted to reduce the number of lamps burning.

All lamps broken in handling or when current is not on the lamps shall be considered as having been broken mechanically and shall not be counted to reduce the number of lamps burning.

(*d*) The labels on the lamps shall show the nominal total watts and voltage.

NOTE.—Owing to the fragile nature of the tungsten filament the preliminary inspection should be made at the factory of the manufacturer, but in any case the lamp manufacturer is relieved from all responsibility for breakage after the lamps have left the factory, excepting in so far as the transportation company may be held responsible. In case of rejection under the terms of these specifications, the party of the first part may return the rejected lamps and obtain credit for all unused lamps that are received in good order by the manufacturer.

It is expressly understood and agreed that clause 1 of the "General specifications," which provides that samples shall be submitted and that manufacturers shall make no change in the shape of the bulb, mechanical construction, or type of filament, nor any departure from the sample lamps in any way, does not apply to the tungsten lamps listed in this schedule. On account of the unsettled condition of tungsten lamp design, etc., and on account of the newness of the tungsten portion of the art, changes in design may be made when necessary.

III. NEW LAMP RATINGS

(Taking effect May 1, 1910)

On May 1 a sweeping change was made by the incandescent lamp manufacturers in the method of rating their lamps.

All lamps are now designated solely by watts. The lamps most commonly used bear upon their labels 3 voltages instead of 1, as heretofore.

1. THE WATTAGE RATING

The metallized carbon, tantalum and tungsten filament lamps have always been rated by watts, a method which has proved to be very convenient. Under the new system, all carbon lamps are similarly rated. The candlepower designation has been abandoned.

2. THE 3-VOLTAGE RATING

The 3-voltage rating has been used for the metallized carbon and tungsten filament lamps in order to facilitate their use at more than one efficiency without employing the somewhat complicated method of rating used in case of carbon lamps. The 3 voltages shown on the lamp label are arranged in a vertical column with the highest at the top, and they decrease by 2-volt steps. The 3-voltage label for a 60-watt lamp may appear as follows:

60 W
112 volts (top voltage)
110 " (middle voltage)
108 " (bottom voltage)

When burned at top voltage the lamp has the highest efficiency or consumes the least energy for the light produced.

3. COMPARISON OF OLD AND NEW LAMP RATINGS

STANDARD OVAL ANCHORED CARBON FILAMENT LAMPS FOR MULTIPLE BURNING 100 TO 130 VOLTS

Volts	Candlepower rating abandoned May 1, 1910				Wattage rating taking effect May 1, 1910. Use designation below in place of designation in columns 2 to 5		Lamps which may be supplied if necessary for corresponding lamp in columns 2 to 5 for about a year, but these lamps are being abandoned	
					(6)		(7)	
(1)	CP (2)	WPC (3)	Watts (4)	Bulb (5)	Watts		Watts	
100–130	4	4.8	19.3	SS–17	20	Sign type		
	6	3.7	22.4	"	25	Middle voltage		
	8	3.1	24.8	"	25	Top voltage		
	8	3.6	28.6	"	30	Middle voltage		
	10	3.1	31.0	"	25	Top voltage		
	10	3.6	35.7	"	30	" "	36	Single voltage
	12½	3.1	38.8	"	50	" "	39	" "
	12½	3.6	45.4	SS–19	50	Middle voltage		
	16	3.1	49.6	"	50	Top voltage		
	16	3.5	56.0	"	60	Middle voltage		
	20	3.0	60.8	"	60	Top voltage		
	20	3.5	69.6	"	60	Middle voltage	70	" "
	24	3.1	74.4	"	60	Top voltage	74	" "
	25	3.6	90.8	SS–24	100	Middle voltage		
	32	3.1	99.2	"	100	Top voltage		
	32	3.6	114.2	"	120	Middle voltage		

STANDARD DOUBLE OVAL ANCHORED CARBON FILAMENT LAMPS FOR MULTIPLE BURNING 200 TO 260 VOLTS

200–260	8	4.4	35.0	PS–19	35	Single voltage		
	16	3.8	60.8	PS–21	60	" "		
	20	3.8	76.0	" "	60	" "	76	Single voltage
	24	3.8	91.2	" "	120	" "	91	" "
	32	3.8	121.6	SS–24	120	" "		
	50	3.8	190.0	B–25			190	" "

STANDARD OVAL ANCHORED CARBON FILAMENT LAMPS FOR STREET-RAILWAY SERIES BURNING 100 TO 130 VOLTS

100–130	10	4.2	41.7	SS–19	42	Street railway		
	16	4.0	64.0	" "	64	" "		
	32	3.6	114.2	" "	114	" "		

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