

# The Reference Cigarette



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## Introduction

During the late 1960's when increased emphasis was being placed on smoking and health research, it was determined that a cigarette that could be used as a research standard should be developed. In 1968, the Scientific Advisory Board of the Council for Tobacco Research requested the Industry Technical Committee to oversee the production of such a cigarette. The University of Kentucky's Tobacco and Health Research Program provided the organizational structure for developing such a cigarette. This Reference Cigarette, the 1R1, served as an international standard for research purposes and was approved by representatives of commercial manufacturers, the University of Kentucky College of Agriculture, and the research program which subsequently became the Tobacco and Health Research Institute (now called the Kentucky Tobacco Research & Development Center). The Reference Cigarette is useful for scientists involved in many aspects of research, and it provides a basis for comparing data that have been collected in different laboratories.

## Composition of the 1R3F Cigarette

1R3F – the Kentucky Tobacco Research & Development Center equivalent to the experimental blend specified and used by the National Cancer Institute as their standard for experimental work. The reconstituted tobacco sheet portion of this blend was manufactured using the Schweitzer Process.

Flue-cured	*32.54%
Burley	20.04%
Turkish	11.09%
Maryland	1.06%
Reconstituted Sheet	27.17%
Invert Sugar	5.30%
Glycerine	2.80%

\*Wet weight basis

## Composition of the 2R4F Cigarette

The development of the 1R4F cigarette was a joint effort by the National Cancer Institute (NIH) Agriculture Research Service-USDA and the Tobacco and Health Research Institute. The blend specifications for this cigarette were based on achieving a design for a cigarette that would deliver approximately 9.2 mg of tar and 0.8 mg of nicotine. These consistent levels were achieved through filtration, air dilution and blend selection. The 2R4F is the second run of the 1R4F.

Flue-cured	*32.51%
Burley	19.94%
Oriental	11.08%
Maryland	1.24%
Reconstituted (Schweitzer)	27.13%
Glycerine	2.80%
Isosweet (sugar)	5.30%

\*Wet weight basis

# Composition of the 1R5F Cigarette

The Tobacco and Health Research Institute initiated development of an ultra low yield cigarette, the 1R5F. The blend and design specifications for this cigarette are such that consistent delivery is approximately 1.67 mg of tar and 0.16 mg of nicotine. These consistent levels are achieved through filtration, air dilution and tobacco blend selection.

Flue-cured	*5.75%
Flue-cured puffed	19.50%
Burley	42.25%
Burley puffed	10.50%
Turkish	7.00%
Reconstituted sheet	15.00%
Glycerine	2.80%
Invert sugar	5.30%

\*Wet weight basis

## Summary Designations for Reference Cigarettes

1. 1R3F – The Kentucky Tobacco Research & Development Center equivalent to the experimental blend specified and used by the National Cancer Institute as their standard for experimental work. The reconstituted tobacco sheet portion of this blend was manufactured using the Schweitzer Process (1974).
2. 2R4F – A low nicotine research cigarette (2001).
3. 1R5F – An ultra low nicotine research cigarette (1989).

## Physical Data

	CRW GM/CIG	RTD CM OF H <sub>2</sub> O	STATIC BURN SEC/40MM	LENGTH MM/ CIG	CIRC. MM/ CIG	PAPER POROSITY SEC/50ml	PAPER ADDITIVE TYPE %
1R3F	1.066	13.00	438	85.00	24.80	18.20	Cit. 0.50
1R5F	0.850	11.60	370	83.90	24.70	* 24.00	Cit. 0.49
2R4F	1.055	13.40	n/d	83.90	24.90	* 24.00	Cit. 0.60

### Key:

GM – Gram

CIG – Cigarette

SEC – Second

CRW – cigarette rod weight

RTD – resistance to draw

CIRC – circumference

PHOS – phosphate

Cit. – citrate

n/d – not determined

\* – Coresta units

## Smoke Analyses FTC Method

	TPM mg/CIG	FTC TAR mg/CIG	NICOTINE mg/CIG
1R3F <sup>1</sup>	18.10	15.0	1.16
1R5F <sup>2</sup>	2.08	1.67	0.160
2R4F <sup>2</sup>	11.70	9.70	0.85

**Notes:**

<sup>1</sup> 30 mm butt length (Length of cigarette butt remaining after smoking.)

<sup>2</sup> 35mm butt length (Length of cigarette butt remaining after smoking.)

**Key:**

TPM – Total Particulate Matter

FTC – Federal Trade Commission

CIG - Cigarette

## Smoke Analyses FTC Method (continued)

	WATER mg/CIG	PUFF COUNT/CIG	CO mg/CIG	NOX mg/CIG
1R3F <sup>1</sup>	1.88	8.60	17.20	0.27
1R5F <sup>2</sup>	0.298	7.18	2.95	0.11
2R4F <sup>2</sup>	1.12	9.20	13.00	0.22

**Notes:**

<sup>1</sup> 30 mm butt length (Length of cigarette butt remaining after smoking.)

<sup>2</sup> 35mm butt length (Length of cigarette butt remaining after smoking.)

**Key:**

CO – Carbon Monoxide

NOX – Nitrogen Oxides

## Storage Recommendations

The Reference cigarettes are stored in the cold (3.3°C and 50-60% relative humidity). One day prior to shipping to purchasers, the cigarettes are removed from cold storage and placed in a humidity-controlled room (23.8°C and 60% relative humidity) for equilibration. Cigarettes that are used within the Kentucky Tobacco Research & Development Center (KTRDC) are placed in environmental control units (23.8°C and 60% relative humidity) for storage until used by the investigators.

Investigators who receive cigarettes from KTRDC and do not have environmental control units are encouraged to place the cigarettes in a plastic bag so that it is airtight and store in a standard laboratory refrigerator until used for the research. This procedure should hold the proper moisture level in the cigarettes. The cigarettes should be exposed for approximately 15 minutes to room temperature and then used immediately.

For information on Reference Cigarettes contact:

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All purchasers will be required to sign a disclaimer before purchasing the cigarettes.