

CANADIAN
NATIONAL

6400-6410

GRAND
TRUNK
WESTERN

An unfortunate feature of the steam locomotive was that the smoke frequently tended to blow down about the cab, obscuring the engineman's vision, particularly when the engine was drifting. It was this problem which led to the distinctive design of CN's streamlined U-4 4-8-4's.

In 1931, CN requested Canada's National Research Council to look into this problem, with the hope that radical changes in the locomotive's shape would yield considerable improvement in smoke flow and wind resistance. NRC's findings, developed from wind tunnel tests on a model of a 6100-class engine, showed that poor aerodynamic design of the domes, stack, etc., on the upper surfaces of the locomotive created eddies which slowed air velocity above the boiler to the extent that smoke was allowed to settle close to it.

A streamlined locomotive cowl was modelled in wood and underwent 27 modifications before NRC's engineers were satisfied; it was determined that when applied to an actual locomotive, a reduction of 35% in air resistance could be expected. The final design comprised a casing around the front end of the locomotive, approximately semi-cylindrical in form, molding into a spherical sector where it joined the top of the smokebox. A smooth casing, covering the stack, sandbox and domes, extended along the boiler top. Louvres in the front end of the casing admitted air about the stack; as this air was deflected upwards out of the casing, it lifted smoke clear of the locomotive. Curved front cab walls contributed to this layer of clean air along the top of the engine.

In June and July, 1936, Canadian National took delivery of five U-4-a 4-8-4's, streamlined along these lines. The first locomotive, No. 6400, was displayed in early June in Montreal's Bonaventure Station, and later in Toronto, at the foot of Simcoe Street.

In terms of boiler capacity and tractive effort, Nos. 6400-6404 lay between the 5700-series Hudsons and the 6100-series 4-8-4's; however, the 5700's had the edge in tractive effort when the booster was cut in. Built for speed, the 6400's had 77" drivers and were fitted

with tender track sprinklers for laying the dust stirred up by fast running. The air compressor and turbogenerator were hidden behind the front cowl, and the front coupler hinged out of sight behind a sliding cover. The bell was mounted behind the louvres at the front of the casing, while the whistle hugged the outside of the casing on the left side. The 6400's were more colorful than had been CN custom to that time; the locomotive front and running gear were black; the running board, cab and tender were green to match CN passenger equipment. The boiler jacket and casing were of polished steel.

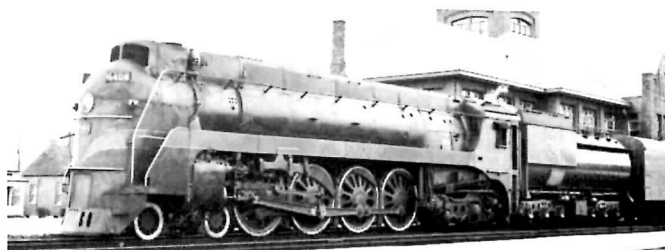
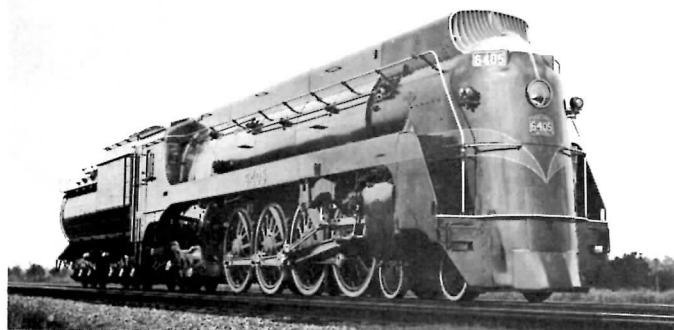
Following delivery, the 6400's were immediately placed in fast passenger service in the Montreal-Toronto-Sarnia cycles of the International Limited and similar trains, covering 10,000 to 14,000 miles per month.

In July and August of 1938, Lima Locomotive Works built six U-4-b's for CN's subsidiary Grand Trunk Western. Nos. 6405-6410 were virtual duplicates of their Canadian sisters, differing primarily in the design of the louvres ahead of the stack.

With the delivery of more modern 4-8-4's in the early 1940's, the 6400's began to appear more frequently on local trains. Their streamlined cowlings proved to be a hinderance to maintenance, particularly where access to the smokebox was concerned; shop crews found that at least one day was required to deal with the nose casing each time the smokebox was opened.

The 6400's had their moments of distinction. In 1936, 6400 hauled a special train from Montreal marking the 100th Anniversary of the opening of the Champlain and St. Lawrence Railroad. In 1938, 6402 hauled President Roosevelt's special train to Kingston for the opening of the Thousand Islands International Bridge. A royal blue and silver 6400 handled the 1939 Royal Tour, followed by a successful visit to the New York World's Fair. Several 6400's had a hand in Princess Elizabeth's 1951 visit; 6403 operated to Winnipeg in this service and made several trips to Saskatoon before returning east, thus earning the distinction of being the only U-4 to operate in the west.

All of the 6400's were retired in 1960, and only 6400 itself remains, as part of CN's Historical Collection.



SUB CLASS	DATE BUILT	BUILDER	BUILDERS ORDER N°	BUILDER'S BOILER N°	PRESENT ROAD N°s	CANADIAN NATIONAL RAILWAYS MECHANICAL DEPARTMENT MONTREAL			
U-4-a	1936	M. L. Co	Q-377	68715 to 68719	6400 to 6404	TYPE NORTHERN CLASS U-4			

SUB CLASS	CYLINDERS		DRIVING WHEELS		FIRE BOX		GRATE AREA SQ. FT.	T U B E S				TENDER CAPACITY		SUPERHEATER	HAULAGE RATING
U-4-a	DIA.	STROKE	O.S. DIA.	DIA. CTR.	LENGTH	WIDTH		LARGE	DIA.	SMALL	DIA.	LENGTH	WATER	COAL	
U-4-a	24"	30"	77"	70"	126 3/8"	84 3/8"	73.6	146	3 1/2"	44"	2 1/4"	21' 10"	11700 GAL	18 TONS	SCHMIDT 'E' 52%

SUB-CLASS	HEATING SURFACE		WEIGHTS IN WORKING ORDER		Lbs.		LIGHT WEIGHTS		FACTOR OF ADHESION		MAXIMUM TRACTIVE EFFORT	BOILER PRESS.
U-4-a	TUBES	FIREBOX	TOTAL	SUPER-HEATER	ENGINE TRUCK	DRIVING	TRAILING	TOTAL ENGINE	TENDER	ENGINE & TENDER	DRIVERS	TOTAL ENGINE
U-4-a	3,471	390	3,861	1530	61,000	236,000	82,800	379,800	280,280	660,080	21,600	344,000

SUB CLASS	STOKER		TYPE OF REVERSE G.	TYPE OF VALVE GEAR	SYPHONS	MULTI THROT.	EX. STM. INJ.	STEAM HEAT	N° & SIZE OF AIR PUMPS	BRICK ARCH	EXTREME WIDTH
U-4-a	SEE SPEC. LIST			BAKER	SEE SPEC. LIST	YES	SEE SPEC. LIST	YES	1-8 1/2 CC	YES	10' 11 1/2"

SUB CLASS	DATE BUILT	BUILDER	BUILDERS ORDER N°	BUILDER'S BOILER N°	PRESENT ROAD N°s	CANADIAN NATIONAL RAILWAYS MECHANICAL DEPARTMENT MONTREAL			
U-4-b	1938	LIMA	CO 1147	7759 to 7764	6405 to 6410	TYPE NORTHERN CLASS U-4			

SUB-CLASS	CYLINDERS		DRIVING WHEELS		FIRE BOX		GRATE AREA SQ. FT.	T U B E S				TENDER CAPACITY		SUPERHEATER	HAULAGE RATING
U-4-b	DIA.	STROKE	O.S. DIA.	DIA. CTR.	LENGTH	WIDTH		LARGE	DIA.	SMALL	DIA.	LENGTH	WATER	COAL	
U-4-b	24"	30"	77"	70"	126 3/8"	84 3/8"	73.6	146	3 1/2"	43"	2 1/4"	21' 10"	14200 GAL	16 TONS	SCHMIDT 'E' 52%

SUB-CLASS	HEATING SURFACE		WEIGHTS IN WORKING ORDER		Lbs.		LIGHT WEIGHTS		FACTOR OF ADHESION		MAXIMUM TRACTIVE EFFORT	BOILER PRESS.
U-4-b	TUBES	FIREBOX	TOTAL	SUPER-HEATER	ENGINE TRUCK	DRIVING	TRAILING	TOTAL ENGINE	TENDER	ENGINE & TENDER	DRIVERS	TOTAL ENGINE
U-4-b	3458	394	3852	1530	62000	237,900	82,800	382,700	270,500	653,200	21,600	344,000



Upper Canada Railway Society
BOX 122 TERMINAL "A" TORONTO
LOCOMOTIVE DATA SHEET

No.
6704

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