

**STATE OF SOUTH CAROLINA
DEPARTMENT OF EDUCATION**

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STATE SUPERINTENDENT OF EDUCATION



Update: South Carolina's School Bus Fleet

November 29, 2016

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Introduction

Since the 1950s, South Carolina has owned, fueled, and maintained the fleet of school buses that transport students to public schools. Currently, the state utilizes 5,582 school buses for regular routes and as spares. This *Update on South Carolina's School Bus Fleet* is provided to inform the public and policymakers of the significant issues confronting our state as we strive to provide safe and timely transportation for our students.

Of significant concern are issues related to the age of the buses in the fleet, the difficulty in recruiting and retaining maintenance technicians and drivers, areas of rapid student growth, and student ride times in excess of ninety minutes. As State Superintendent of Education, I am providing this update so that the people of South Carolina are aware of the significant needs related to our student transportation system.

A handwritten signature in blue ink that reads "Molly M. Spearman". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

Molly M. Spearman
State Superintendent of Education

South Carolina's Fleet

South Carolina has a large fleet of school buses as indicated in this table (as of October 18):

Bus Type	Route Buses	Spare Buses	Decommissioned
Type D S/N's (rear engine transit)	394	77	7
Type D regular (rear engine transit)	1,951	128	209
Subtotal – Type D	2,345	205	216
Type C S/N's (front engine)	550	47	25
Type C regular (front engine)	2113	322	54
Subtotal – Type C	2,663	369	79
Bus Fleet	5,008 Route Buses	574 Spare buses	295
ALL ROUTE/SPARE	5,582 units		

Through an emergency procurement and a second purchase under new specifications, the South Carolina Department of Education (SCDE) is purchasing 855 new buses for delivery in the school year 2016–17. The first twelve buses were delivered October 19, 2016.

Fifteen Year Replacement Cycle

In 2007, our legislature passed Act 79, mandating a bus replacement cycle that would each year replace approximately one-fifteenth of the fleet with new buses. S.C. Code § 59-67-580(A). The replacement cycle does not take into account additional buses needed for statewide growth in the student population. Despite these good intentions, funding for the fifteen-year replacement cycle has been episodic and impacted by the 2008 Recession. Based upon the current fleet size, it would require approximately 380¹ new buses per year, at an average cost of \$89,614 each, or a recurring appropriation of \$34.1 million per year. Although the overall bus funding has increased in the recent past, the recurring appropriation is currently \$3 million/year. The following table lists the bus purchases since the replacement cycle was adopted, and indicates how far behind the state is in meeting the replacement target.

Year	15th of Fleet	Number Ordered	Number Delivered	Recurring Appropriation	One-Time Non-Recurring Funds
2007–08	380	527	527	\$10,676,931	\$30,546,069
2008–09	380	0	0	\$10,676,931	\$00
2009–10	380	2(Hybrid)	2(Hybrid)	\$19,377	\$00
2010–11	380	2(Hybrid)	2(Hybrid)	\$15,506	\$00
2011–12*	380	0	0	\$15,506	\$12,350,000
2012–13	380	342	342	\$15,506	\$12,467,000
2013–14	380	240	9	\$1,015,506	\$22,510,000
2014–15*	380	299	530	\$1,015,506	\$19,071,519
2015–16**	380	490	0	\$1,015,506	\$23,905,000
2016–17	380	365	150	\$3,015,506	\$20,277,209
Total	3,800	2,267	1,562	\$27,481,781	\$141,126,797
Shortfall		1,533	2,238		

¹ One-fifteenth of the current route and spare bus fleet of 5,582 is 372 buses; however, as is noted in the chart and is discussed below, that number has been reduced by the 295 decommissioned buses. When added to the active fleet, that total of 5,877 buses would require 392 replacement buses per year. For purposes of this report, the agency is using the in-between figure of 380 buses as 1/15th of the fleet.

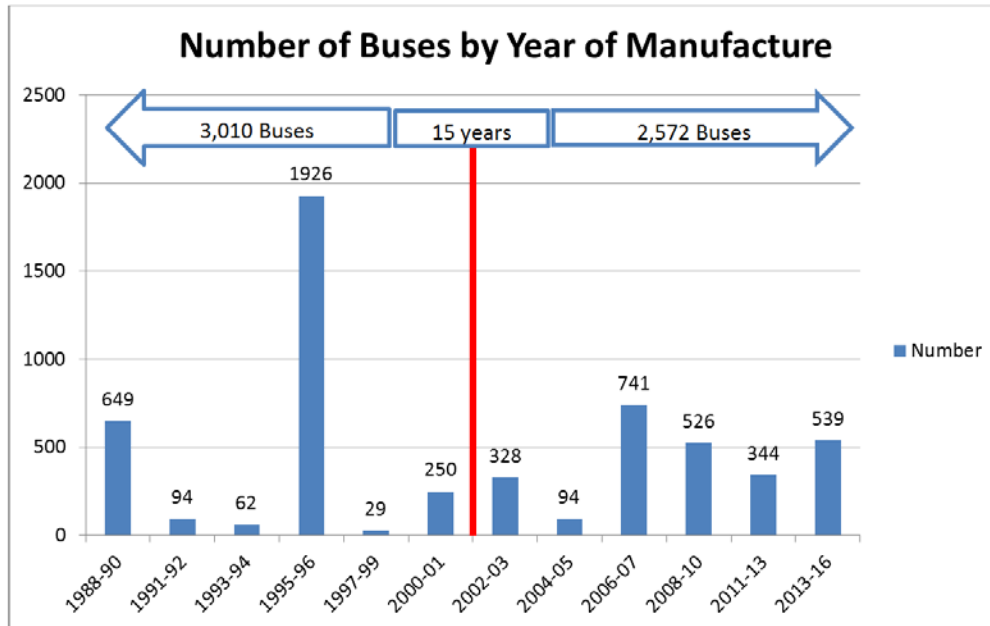
*In these years a contract with current specifications for purchase of buses was in the procurement process.

**Includes \$3 million in planned first year payment of a lease-purchase for 175 buses. Issues related to insurance required use of a new leasing vendor. The Insurance Reserve Fund caps liability well below the value of the fleet being purchased, which was a barrier with the initial vendor.

Age of the Fleet

Although the average age of the buses in the fleet is 15.5 years, the manufacture dates of these buses ranges almost thirty years, from 1988 to 2016. In 1994, the state enacted a bond bill that led to the purchase of over 2,100 buses. Those 21-year old, Type D, rear-engine buses have served our state well; however, they are now having significant issues. The rear-engine configuration also makes these buses more difficult to inspect, service, and maintain. Currently the Type D bus makes up 45.7 percent of the total bus fleet.

The following chart shows the numbers of route and spare buses in the fleet by age of the bus:



1988-90	1991-92	1993-94	1995-96	1997-99	2000-01	2002-03	2004-05	2006-07	2008-10	2011-13	2013-16
649	94	62	1,926	29	250	328	94	741	526	344	539
11.6%	1.7%	1.1%	34.5%	0.5%	4.5%	5.9%	1.7%	13.3%	9.4%	6.2%	9.7%

Maintaining the Fleet

Most buses are inspected at least seven times per year, with special inspections whenever safety concerns arise. New software installed at some shops allows the agency to better “triage” inspections, reducing the required number from seven to five inspections in those shops. The following estimates the labor costs related to inspections of the fleet (part costs are not included).

Number of Inspections per Bus	7
Number of Buses	5,582
Number of Annual Inspections	39,074
Average Inspection Time	25 minutes
Estimated Hours for Inspections	16,281
Average Technician's Wage	\$16/hour
Fringe with employee-spouse coverage	\$8.03/hour
Cost of Wages for Annual Inspection Program	\$391,232

The fleet travelled 82.2 million miles last year. The agency estimates that the cost per mile for fuel and parts to operate the 1995–96 buses is \$.49, compared to \$.21/mile for the buses purchased between 2013 and 2015. A newer fleet reduces overall and recurring operating costs.

Safety Issues

School Bus Thermal Events

The occurrence of bus fires and dangerous overheating (collectively called “thermal events”) has increased over the years. There was a spike in 2004–07; cabling changes were made to reduce the risk of overheating or fire. Since 2012, the incidence of thermal events is again on the rise.

The following summarizes these occurrences by bus type, year, and whether the buses were removed from the fleet:

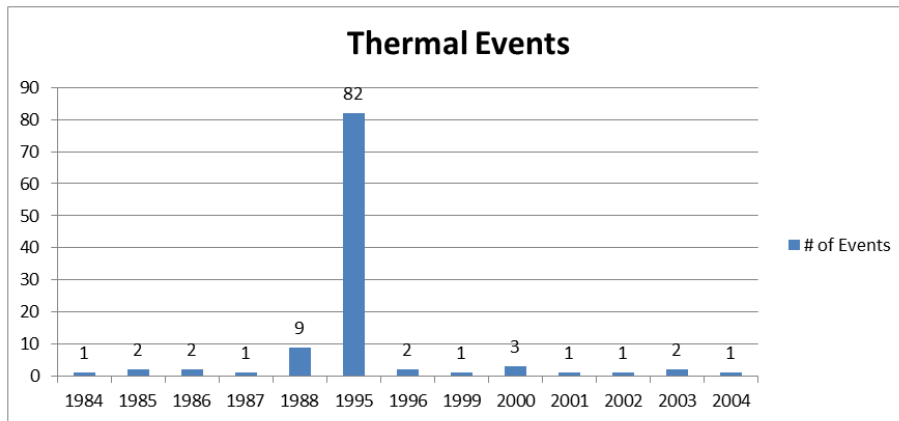
Year	# of Events	Type C	Type D	Units Totalled	Estimated value at time of loss
FY95–96	1	1	0	1	\$8,000
FY96–97	0	0	0	0	\$0
FY97–98	0	0	0	0	\$0
FY98–99	0	0	0	0	\$0
FY00–01	1	0	1	0	\$0
FY01–02	1	0	1	0	\$0
FY02–03	3	0	3	1	\$32,000
FY03–04	1	0	1	1	\$28,000
FY04–05	6	0	6	2	\$52,000
FY05–06	7	1	6	3	\$77,000
FY06–07	21	5	16	2	\$44,000
FY07–08	6	2	4	2	\$44,000
FY08–09	4	0	4	2	\$40,000
FY09–10	8	2	6	3	\$45,000
FY10–11	6	2	4	2	\$34,000
FY11–12	5	1	4	1	\$12,000
FY12–13	9	1	8	4	\$47,000
FY13–14	7	1	6	4	\$34,000
FY14–15	7	1	6	5	\$28,000
FY15–16	13	5	8	10	\$44,000
FY16–17	1	0	1	1	\$4,000
Total	108	22	86	45	\$575,000

Type D, rear-engine transit-style buses were involved in 79.6 percent of the thermal events since 1995. Through inspections the SCDE determined that for most (69.4 percent) of those events wiring/electrical and turbocharger issues were the cause or source of the fire or overheating. The following shows the causes of the thermal events and bus type:

	Type C						Type C Total	Type D						Type D Total	Grand Total	
	Brake	Electrical	Engine Failure	Mechanical	Other	Turbocharger		Brake	Electrical	Engine Failure	Mechanical	Seal	Tire			Turbocharger
FY 95/96				1			1	1								1
FY 00/01									1							1
FY 01/02										1						1
FY 02/03									1				1			3
FY 03/04											1					1
FY 04/05										1			1		3	6
FY 05/06				1				1		5					1	6
FY 06/07		4					1	5	1	4	2	2	1		6	16
FY 07/08		2						2		1	2				1	4
FY 08/09											1				3	4
FY 09/10		1				1		2		2	1				3	6
FY 10/11		1		1				2							4	4
FY 11/12			1							2					2	4
FY 12/13	1							1		2					5	9
FY 13/14				1				1		2		2	1		1	6
FY 14/15				1				1		2		1			3	6
FY 15/16		3		1	1			5		4	1			1	2	8
FY 16/17										1						1
Grand Total	1	12	4	3	1	1	22	3	27	9	7	3	2	35	86	108

- Brakes 3.7%
- Electrical 36.1%
- Engine Failure 12.0%
- Mechanical 9.3%
- Other 0.9%
- Seal 2.8%
- Tires 1.9%
- Turbocharger 33.3%

The following table shows the manufacturing years of these buses; 76 percent are 1995s, which overall are more than one-third (34.5 percent) of the fleet:



Actions Taken Concerning Thermal Events

All buses involved in thermal events are inspected by shop personnel for their possible causes, and recommendations are made for ways to help prevent future such events. In addition to five to seven routine inspections, all thermal events that incur damages in excess of \$1,000 are inspected by at least two experienced field technical support staff and a report is provided to the Director for Maintenance. The agency has taken numerous steps over time to minimize the risk of thermal events. For example, the increases in fires in fiscal years 2004–07 led to rerouting of cables and additional brackets to reduce likelihood of overheating or chafing. Battery cable re-routing, better securing of cables, reinforced casings with grommets to reduce chafing, and updated inspection processes have been instituted to minimize potential risks.

In May 2016, the agency issued an emergency procurement for immediate purchase of new buses to replace those taken out of service due to thermal events (see further discussion below).

Recommendations for Additional Action for Thermal Events

The agency has requested an independent review of its inspection processes. The SCDE will develop resources to implement any recommendations.

The agency requested and received delegated authority from the State Fiscal Accountability Authority Procurement Services to issue a solicitation for heat sensors and alarms that would increase the likelihood drivers would be aware of overheating that might result in a fire at the rear of the Type D buses. The intent to award posted November 30 would provide each alarm at a cost of approximately \$558. These could be installed on approximately 2,550 route and spare rear-engine buses in the fleet at a cost of approximately \$1,422,900 (plus sales tax; protest period ends December 9). Carryforward funds have been reserved for this purpose. All bus drivers will need to be trained on how to respond to an alert from these sensors.

The Type D buses from 1995–96 were equipped with an extra water-fuel separator located in the engine compartment at the back of the bus. The SCDE is removing this filter to mitigate against any unnecessary fuel sources, should shorts or sparks occur in the nearby electrical systems.

The SCDE contacted the manufacturer of the 1995 buses. Thomas Built Buses agreed to send an expert team to review the agency's maintenance of and changes to the buses, and to advise on ideas for other actions that could reduce the likelihood of overheating and fire. This inspection occurred November 14-16, 2016. The engineer and support team from Thomas Built Buses reported that their general observation is that the SCDE has a sound, defined process for inspecting and ranking the condition of vehicles in the fleet. The SCDE Engineering Associates are knowledgeable about the inspection process, which results in fair assessments and rankings of vehicle conditions. The Thomas team made additional recommendations related to electrical routing, which are being reviewed for decision on implementation by the SCDE.

The SCDE has requested an increase in technician salaries so that it may hire and retain qualified technicians who can maintain this aging fleet in a safe manner.

The SCDE recommends immediate attention and priority funding to accelerate the replacement of the 1995–96 Type D buses.

Structural defects

In 2004–05, the 1995–96 Thomas Built buses were the subject of a recall for cracks in the framing structure (Recall 04V-389). In 2008, some of South Carolina’s Thomas rear-engine Type D buses were returned to the manufacturer for structural repair related to roof bows, the curved metal supports of the bus roof. The manufacturer used welding or adhesive to add square tubes to the steel roof bows to increase support.



In spring 2016, while repairing a 1995 bus, the SCDE technicians saw cracks in that bus’s roof bows. This led to inspection of all similar buses, some of which had been part of the 2008 structural repair.

Actions Taken Concerning Structural Concerns

The SCDE has inspected all 1995–96 Type D buses for weakened roof supports. The agency immediately decommissioned approximately 135 buses, and on May 3, 2016, issued an emergency procurement to purchase 150 new buses (135 decommissioned and 15 to replace buses engaged in thermal events). An emergency procurement was required because of delays and protests related to the specifications and the new Request for Proposals for school buses. Delivery on that order began in October 2016 and is now complete.

The SCDE has now decommissioned a total of 152 buses, and used spare buses until delivery of the newly-purchased buses. The SCDE has also determined that some of the structural repairs done with adhesive in 2008 are no longer properly bonded to the roof bows. Approximately 400 additional buses were identified through inspection as having less severe structural issues. Independent shops have estimated that these buses could be repaired for an approximate initial cost of \$5,000 each, an amount higher than the approximate market value of these buses. All of these buses are outside the fifteen-year cycle, so replacement buses are preferable. Therefore, the SCDE is pursuing purchase of more than 1/15th of the fleet for this fiscal year. Although the

normal replacement cycle is 380 buses, the agency ordered 490 new buses before the end of FY 2015–16, planning in part to use a lease finance mechanism. The 490 includes the 150 mentioned above through emergency procurement and 365 under the new procurement and specifications. The buses with thermal risk and structural damage will be the first to be replaced, despite older buses existing in the fleet. The SCDE has amended its inspection processes to include a frequent and specific inspection process for identifying these problems and will continue removing buses from service if deemed necessary.

In October 2016, the SCDE used carryforward and FY 2016–17 funds to purchase 200 buses in addition to last fiscal year’s order of 490. In November an additional 165 were ordered. An order for 85 additional buses may be possible depending upon the timing of the lease-purchase financing and fuel prices.

Bus Purchases		1/15th	
FY 2015–16 – Emergency Procurement	150		
FY 2015–16 – New Specs. - Lease	175		
FY 2015–16 – New Specs. - Purchase	165		380
Subtotal Ordered		490	+110
FY 2016–17 – October orders	200		
FY 2016–17 – November orders	165		380
Subtotal Ordered		365	-15
Total Ordered		855	+95
Potential Additional FY 2016-17	85	940	+180

The manufacturer of the 1995 Thomas Built Buses has sent a team of experts to inspect the buses with damage, review the SCDE’s inspection program, and offer suggestions on remedies. This occurred November 14-16, 2016.

As is noted above, the 1995–96 buses are over one-third of the fleet. The deliveries this fiscal year could reduce that to 19.2 percent of the fleet. As of November 29, the number of 1995-96 buses remaining is 1,140. If the fifteen-year replacement cycle (380 buses) is not accelerated, it would take three more years to replace all of the 1995–96 buses, while leaving 805 older buses on the road.² To replace all of the 1995-96 buses would cost approximately \$102 million.³ If recurring funding is increased and the leasing option is successful, then this amount could be spread out over a longer period (e.g., \$21.8 million per year for 5 years).⁴

² The SCDE has received unofficial notice of an Environmental Protection Agency grant award that could provide approximately \$100,000 in exchange for taking about five older buses off the road and destroying the engines. Acceptance of the award may shift these figures if we use buses on order to comply with the grant.

³This is based upon purchase of 43 special needs buses at \$84,053; 670 72-passenger Type C buses at \$80,246; and 427 78-passenger Type D buses (manufactured by Blue Bird) at \$104,545.

⁴ This would need to be in addition to the \$3 million recurring that is already being used to purchase 175 buses.

Recommendations for Additional Action Related to Structural Concerns

The SCDE initiated lease purchase paperwork to increase the number of buses ordered in FY 2015–16; however, fiscal responsibility requires our limiting the size of that procurement to what we can afford with recurring appropriations. An increase in the recurring bus purchase line would create more flexibility in expanding the earlier purchase through leasing. In addition, the agency has encountered a potential barrier to future leasing: the Insurance Reserve Fund caps liability at an amount less than the value of the fleet being leased. One lender was not willing to issue the lease without additional assurances. The SCDE has pursued a new lending option, which is scheduled to close with Bank of America on December 8.

On November 14-16, 2016, at the request of the SCDE, Thomas Built Buses' engineering and support team reported that their general observation is that the SCDE has a sound, defined process for inspecting and ranking the condition of vehicles in the fleet. The SCDE Engineering Associates are knowledgeable about the inspection process, which results in fair assessments or rankings of vehicle conditions. The Thomas team made recommendations as to frequency and type of inspections. Recommendations from the team are being reviewed for decision on implementation.

The SCDE recommends immediate attention and priority funding to accelerate the replacement of the 1995–96 Type D buses.

Summary of Recommendations

The following summarizes recommended actions:

1. Obtain an independent verification of the quality of existing inspection programs.
2. Continue to inspect all buses to ensure that they meet required national standards.
3. Evaluate the recommendations of the manufacturer's team as to other viable repairs and safety precautions and implement as appropriate.
4. Complete procurement and installation of heat sensors and alarms in all rear-engine buses and train bus drivers on the new alarm and other warning signs of potential fire.
5. Complete removal of the extra fuel filters in rear-engine buses from 1995–96.
6. Complete purchases of new buses to replace 1995-96 Type D buses.
7. Complete the first lease-purchase for additional school buses.
8. Review the replacement cycle to ensure pupil growth is accounted for in the calculation.
9. Include legislative and budget recommendations to ensure an efficient and safe transportation system through adequate replacement cycles, bus shop technician staffing, and professional development.
10. Support opportunities for districts/regions to increase efficiency and safety of their pupil transit system.