HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ALVIN K. TOMITA
DEPUTY FIRE CHIEF

May 7, 2009

The Honorable Nestor Garcia, Chair
and Members of the Budget Committee
Honolulu City Council
530 South King Street, Room 202
Honolulu, Hawaii 96813

Dear Chair Garcia and Councilmembers:

Subject: Budget Communication 18
National Fire Protection Association (NFPA) Standards

This is in response to the Budget Committee's questions of April 29, 2009, regarding the Honolulu Fire Department's (HFD) apparatus replacement schedule and how it complies with the recommendations set by the NFPA.

Question 1. Apparatus Replacement Schedule

Answer: We are updating the HFD's Fleet Management Program to reflect the current NFPA 1901 Annex D Guidelines. The attached document was updated and adopted in December 2006. An up-to-date listing on the status of our fleet is attached.

Question 2. NFPA Recommendations

Answer: The NFPA 1901 Annex D Guidelines for First-Line and Reserve Fire Apparatus is attached.

DEPT. COM. 352

Thank you for your continued support. Should you have any questions, please contact me at 723-7101.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/EK:jo

Attachments

APPROVED:

Rix Maurer III, Director
Department of Budget and Fiscal Services

APPROVED:

Kirk W. Caldwell
Managing Director

HONOLULU FIRE DEPARTMENT
FLEET MANAGEMENT PROGRAM

Summary. The Honolulu Fire Department (HFD) is entering the tenth year of its Fleet Management program.

Budget constraints in previous fiscal years limited the purchase of fire apparatuses. As a result, 45% or 19 of the HFD's 42 first-line pumper apparatuses will be 15 years or older by the end of calendar year 2007. Of these, 68% or 13 first-line pumper apparatuses are standard shift. The HFD anticipates the delivery of three pumper apparatuses in calendar year 2007. Subsequent to these deliveries, 38% or 16 first-line pumper apparatuses will be 15 years or older by the end of calendar year 2007.

Additionally, 40% or 6 of HFD's 15 first-line aerial apparatus will be 15 years or older by the end of calendar year 2007. Of these, 33% of the first-line aerial apparatuses are standard shift.

By the end of calendar year 2007, 16 pumpers, six aerials, and four tankers will exceed 15 years of age.

It is generally accepted that older apparatuses, like most mechanical devices, have a finite life. Likewise, they will have a higher frequency of repairs, longer durations of downtime, and higher repair costs than newer apparatuses. Additionally, locating and securing replacement parts exacerbates repair and maintenance costs as suppliers discontinue production of replacement components for older apparatuses. For this summary, actual downtime and repair costs were not analyzed due to staffing constraints; however, it is not expected that the data would be significantly different.

Recommendations. The objectives of the replacement program are to provide: a first-line fleet of reliable, technologically modern fire fighting apparatuses; a reliable fleet of reserve apparatuses to serve as backup to the first-line fleet and one available for

instant staffing by recalled personnel in the event of a large scale natural or man-made disaster or emergency; and to reduce the frequency, cost, and related downtime of apparatuses to conduct repair and maintenance on older apparatuses.

To maintain an even distribution of apparatuses in both first-line and reserve status, the following replacement formula is recommended:

$$N \div L = R$$

N = Number of First-Line Apparatus Required
L = Expected Service Life
R = Annual Replacement (Purchase)

The determining variable in this formula is the expected service life assigned to different types of apparatuses. Generally, the expected service life is as follows:

Pumpers: 10 to 15 years
Aerials*: 15 to 20 years
Other**: 10 to 15 years

*Aerials include Tractor-Trailer, Quint, and Tower-type fire apparatuses
**Other includes Tanker, Hazardous Material, Rescue, and Specialized or Miscellaneous fire apparatuses

Applying the formula to the different apparatuses gives the following:

Pumpers: $42 \div 10 = 4.2$/year Three to four units every year
$42 \div 15 = 2.8$/year

Aerials:	15 ÷ 15 = 1/year	One unit every one to two years
	15 ÷ 20 = .75/year	
Other:	11÷ 10 = 1.1 /year	One unit every one to two years
	11 ÷ 15 = .73/year	

Using this formula, we recommend a minimum of four replacement apparatuses and as many as eight apparatuses each year as service life is exhausted. Regular replacement of older apparatuses with new automatic transmission apparatuses will improve the delivery of emergency service by reducing response time and improve efficiency by reducing repair costs and downtime due to discontinued components on older apparatuses. In replacing apparatuses beyond their expected service life, the procurement schedule can be applied as follows:

2007 - 2008: Three pumpers, one aerial, and two other
2008 - 2009: Three pumpers, one aerial
2009 - 2010: Four pumpers, one other
2010 - 2011: Four pumpers, one other
2011 - 2012: Three pumpers, one aerial
2012 - 2013: Four pumpers, one other

This schedule is only a guide. Acquisitions may be accelerated or adjusted depending on mechanical assessments and the reliability of individual apparatuses. In some instances, apparatuses may exceed the expected service life. Others may fail to meet the expected service life due to varying incident demands between the respective apparatus assignments and the resulting wear and tear, as well as, accidents and other unforeseen circumstances. The replacement schedule may be increased and adjusted with the addition of station locations and one or more apparatuses assigned to that station.

Currently, the HFD is not aware of any local aftermarket for used apparatuses other than the sale for scrap. The other counties prefer new rather than used apparatuses even at no or minimal cost. Shipping to other markets is cost prohibitive. We are in a unique geographic situation and must use our apparatuses to the limits of service.

CHASSIS

ENGINE

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
141	1987	Seagrave	NTC/400HP	2009 (1)	CT-HFD-0800458	2010	23	
142	1987	Seagrave	NTC/400HP	2009 (1)	CT-HFD-0800458	2010	23	
143	1987	Seagrave	NTC/400HP	2009 (1)	CT-HFD-0800458	2010	23	
144	1987	Seagrave	NTC/400HP	2010 (1)		2010	23	
14	1988	Seagrave	NTC/300HP	2010 (1)		2010	22	
25	1988	Seagrave	NTC/300HP	2010(1)		2010	22	
58	1988	Seagrave	NTC/300HP	2010(1)		2010	22	
59	1988	Seagrave	NTC/300HP			2010	22	
177	1988	Seagrave	LTA-10/300HP			2010	22	
168	1989	Seagrave	LTA-10/300HP			2010	21	
169	1989	Seagrave	LTA-10/300HP			2010	21	
170	1989	Seagrave	LTA-10/300HP			2010	21	
171	1989	Seagrave	LTA-10/300HP			2010	21	
175	1989	Seagrave	LTA-10/300HP			2010	21	
176	1989	Seagrave	LTA-10/300HP			2010	21	
178	1989	Seagrave	LTA-10/300HP			2010	21	
202	1991	Seagrave	8V-92TA/450HP			2010	19	
203	1991	Seagrave	8V-92TA/450HP			2010	19	
204	1991	Seagrave	8V-92TA/450HP			2010	19	
206	1992	Seagrave	8V-92TA/450HP			2010	18	
207	1992	Seagrave	8V-92TA/450HP			2010	18	
208	1992	Seagrave	8V-92TA/450HP			2010	18	
225	1993	Seagrave	8V-92TA/450HP			2010	17	
226	1993	Seagrave	8V-92TA/450HP			2010	17	
227	1993	Seagrave	8V-92TA/450HP			2010	17	
239	1997	Pierce	S60/470HP			2010	13	
240	1997	Pierce	S60/470HP			2010	13	
241	1997	Pierce	S60/470HP			2010	13	
238	1999	Pierce	S60/470HP			2010	11	
252	1999	Pierce	S60/470HP			2010	11	
253	1999	Pierce	S60/470HP			2010	11	
254	1999	Pierce	S60/470HP			2010	11	
255	1999	Pierce	S60/470HP			2010	11	
256	1999	Pierce	S60/470HP			2010	11	
257	1999	Pierce	S60/470HP			2010	11	
258	1999	Pierce	S60/470HP			2010	11	
267	2000	Pierce	S60/470HP			2010	10	
268	2000	Pierce	S60/470HP			2010	10	
274	2001	Pierce	S60/470HP			2010	9	
275	2001	Pierce	S60/470HP			2010	9	
276	2002	Pierce	S60/470HP			2010	8	
277	2002	Pierce	S60/470HP			2010	8	
308	2006	Pierce	S60/515HP			2010	4	
309	2006	Pierce	S60/515HP			2010	4	
310	2006	Pierce	S60/515HP			2010	4	
313	2006	Pierce	S60/515HP			2010	4	
312	2007	Pierce	S60/515HP			2010	3	
319	2008	Pierce	S60/515HP			2010	2	
323	2008	Pierce	S60/515HP			2010	2	
324	2008	Pierce	S60/515HP			2010	2	
326	2008	Pierce	S60/515HP			2010	2	

328	2008	Pierce	S60/515HP			2010	2	
329	2008	Pierce	S60/515HP			2010	2	
331	2008	Pierce	S60/515HP			2010	2	
332	2008	Pierce	S60/515HP			2010	2	
							13.218182	Mean

AERIAL/QUINT/TOWER

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
154	1988	Seagrave	NTC/300HP	2008	S-900305	2010	22	
155	1988	Seagrave	NTC/300HP	2009 (2)	S-900343	2010	22	
156	1988	Seagrave	NTC/300HP	CDBG	S-900305	2010	22	
157	1988	Seagrave	NTC/300HP		CDBG alternate	2010	22	
194	1990	Seagrave	NTC/350HP			2010	20	
214	1992	Seagrave	8V-92TA/450HP			2010	18	
215	1992	Seagrave	8V-92TA/450HP			2010	18	
216	1992	Seagrave	8V-92TA/450HP			2010	18	
228	1993	Seagrave	8V-92TA/450HP			2010	17	
229	1993	Seagrave	8V-92TA/450HP			2010	17	
242	1997	Pierce	S60/470HP			2010	13	
243	1997	Pierce	S60/470HP			2010	13	
262	1999	Pierce	S60/471HP			2010	11	
259	1999	Pierce	S60/470HP			2010	11	
264	1999	Pierce	S60/470HP			2010	11	
263	1999	Pierce	S60/470HP			2010	11	
269	2001	Pierce	S60/500HP			2010	9	
278	2002	Pierce	S60/500HP			2010	8	
							15.722222	Mean

TANKER

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
153	1988	Internationa	NTC-300	2008	S-900541	2010	22	
160	1989	Internationa	NTC-315	2010 (5)		2010	21	
183	1990	Firehorse	NTC/300HP			2010	20	
195	1990	Firehorse	NTC/300HP			2010	20	
205	1991	Peterbilt	L10-300	2008	S-900542	2010	19	
244	1998	Peterbilt	S60/470HP			2010	12	
297	2004	Peterbilt	ISC-330			2010	6	
298	2004	Peterbilt	ISC-330			2010	6	
							15.75	Mean

RESCUE

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
180	1989	Seagrave	NTC-300			2010	21	
306	2006	Pierce	S60/515HP			2010	4	
307	2006	Pierce	S60/515HP			2010	4	
							9.6666667	Mean

HAZMAT

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
179	1989	Seagrave	NTC-300			2010	21	
265	2000	Pierce	S60/470HP			2010	10	
266	2000	Pierce	S60/470HP			2010	10	
							13.666667	Mean

BRUSH

247	1982	International				2010	28	
316	1995	FORD	B5.9L/190HP			2010	15	
							21.5	Mean

COMMAND

271	2003	Spartan	ISL6370			2010	7	**Mean**

BOAT

APP.	YEAR	MAKE	MOTOR	FUNDING	DISPOSITION	YEAR	AGE	
1001	1991	Force 22		2009 (6)		2010	19	
1011	2000	Radon				2010	10	
1017	2002	BW 17' #50440				2010	8	
							12.333333	**Mean**

AUXILIARY APPARATUSES

APP	YR	MAKE/MODEL	SERIAL NO.	DISPOSITION	FUNDING	YEAR	AGE	
67	1987	FORD UTILITY	2FDHF37H1HCBO3801	rqs 900599	2009 (13)	2010	23	
74	1987	TOYOTA VAN	JT4YR28V4H5O35224	spec	2009 (8)	2010	23	
146	1987	CHEV 2X4	1GCGR33K1HS173643	spec	2009 (5)	2010	23	
270	1987	SCANIA	1S9N11648HC098151			2010	23	
52	1988	CHEV 4X4	1GCHV33K2JJ116010	spec	2009 (5)	2010	22	
53	1988	CHEV 4X4	1GCHV33K9JJ116022	spec	2009 (5)	2010	22	
148	1988	FORD LTD	2FABP72FOJX214056	rqs 900539	2008	2010	22	
150	1988	FORD LTD	2FABP72F3JX218165	rqs 900539	2008	2010	22	
151	1988	FORD CROWN	2FABP72F5JX214053	rqs 900599	2009 (4)	2010	22	
164	1989	FORD VICTORIA	2FABP72F7KX215982	rqs 900599	2009 (4)	2010	21	
165	1989	FORD VICTORIA	2FABP72F9KX215983	rqs 900599	2009 (4)	2010	21	
166	1989	FORD LTD	2FABP72F5KX215981	rqs 900599	2009 (12)	2010	21	
174	1989	GMC JIMMY 4X4	1GKCT18Z2K8538219	spec	2009 (8)	2010	21	
181	1990	RAMCHARGER	3B4GM17YXLM012773	delivery 01/09	2007	2010	20	
185	1990	CHEV BLAZER	1GNEV18K6LF159665	rqs 900539	2009 (3)	2010	20	
186	1990	CHEV BLAZER	1GNEV18K3LF161020	rqs 900539	2009 (3)	2010	20	
188	1990	CHEV VAN	1GCCG15Z6M7101983	spec	2009(16)	2010	20	
190	1990	CHEV CAPRICE	1G1BL54E7LA158006	rqs 900599	2009 (14)	2010	20	
191	1990	CHEV CAPRICE	1G1BL54E0LA158560	rqs 900599	2009 (14)	2010	20	
193	1990	CHEV CAPRICE	1G1BL54E0LA158350	rqs 900599	2009 (14)	2010	20	
196	1990	CHEV UTILITY	1GBGC24K6LE244057			2010	20	
198	1991	CHEV CAPRICE	1G1BL53E9MR141826			2010	19	
199	1991	CHEV CAPRICE	1G1BL53E7MR142280			2010	19	
200	1991	CHEV CAPRICE	1G1BL53E7MR141694		2010 (11)	2010	19	
201	1991	DODGE PICKUP	1B6KE3655MS327605			2010	19	
210	1992	CHEV CAPRICE	1G1BL53E6NR150615			2010	18	
211	1992	CHEV CAPRICE	1G1BL53E0NR149055			2010	18	
212	1992	CHEV CAPRICE	1G1BL53E3NR150670			2010	18	
217	1992	CHEV FLATBED	1GBKC34N7NJ107429		2010 (9)	2010	18	
218	1992	CHEV FLATBED	1GBKC34N6NJ107583		2010 (9)	2010	18	
219	1992	CHEV FLATBED	1GBKC34N9NJ107531			2010	18	
220	1992	FORD SERVICE	1FDXH81A7NVA31992			2010	18	
222	1993	CHEV CAPRICE	1G1BL537XPR130095			2010	17	
223	1993	CHEV CAPRICE	1G1BL5378PR130029			2010	17	
224	1993	CHEV CAPRICE	1G1BL5377PR129390			2010	17	
230	1993	CHEV VAN	1GCFG35K6PF362441			2010	17	
232	1993	GMC 4X4 TRUCK	1GDGK24K9PE547096			2010	17	
236	1994	SUBURBAN	1GNGK26FXRJ427099			2010	16	
272	1996	FORD/HANDI-VAN	1FDLE40F3THB08768			2010	14	
273	1996	FORD/HANDI-VAN	1FDLE40F7THA91439			2010	14	
282	1996	FORD/HANDI-VAN	1FDLE40F6THB16573			2010	14	
292	1997	CHEV SEDAN	2G1WL52M8V9289083			2010	13	
293	1997	CHEV SEDAN	2G1WL52M0V9284864			2010	13	
294	1997	CHEV SEDAN	2G1WL52M0V9285822			2010	13	
295	1997	CHEV SEDAN	2G1WL52MXV9289280			2010	13	
303	1997	CHEV LUMINA	2G1WL52M2V9285515			2010	13	
304	1997	CHEV LUMINA	2G1WL52M2V9284607			2010	13	
245	1998	TAHOE	1GNEK13R2XJ330959			2010	12	
296	1998	CHEV SEDAN	2G1WL52K5W9331032			2010	12	

246	1999	FORD	1FTWW32F9XEA72193			2010	11	
248	1999	FORD	2FAFP71W7XX116136			2010	11	
249	1999	FORD	2FAFP71W9XX116137			2010	11	
250	1999	FORD	2FAFP71W0XX116138			2010	11	
251	1999	FORD	2FAFP71W5XX116135			2010	11	
260	1999	FORD EXPEDITION	1FMPU18L0XLC20685			2010	11	
261	1999	FORD EXPEDITION	1FMPU18L9XLC20684			2010	11	
279	2002	FORD/EXPEDITION	1FMPU16L22LA63379			2010	8	
280	2002	FORD/EXPEDITION	1FMPU16L02LA63378			2010	8	
281	2002	FORD/EXPEDITION	1FMPU16L92LA63380			2010	8	
283	2003	FORD/CREW CAB	1FTSW31L73EC36136			2010	7	
284	2003	FORD/CREW CAB	1FTSW31L93EC36137			2010	7	
285	2003	FORD/CREW CAB	1FTSW31L03EC36138			2010	7	
286	2003	FORD/CREW CAB	1FTSW31L23EC36139			2010	7	
287	2003	FORD/CREW CAB	1FTSW31L93EC36140			2010	7	
288	2003	FORD/DUALLY	1FTWX32S13EC28912			2010	7	
289	2003	FORD/DUALLY	1FTWX32S33EC28913			2010	7	
290	2003	FORD STAKE TRUCK	1FDWF36S43EC09635			2010	7	
291	2003	FORD VAN	1FTSE34L43HB32541			2010	7	
299	2004	FORD	2FAFP71W74X119582			2010	6	
300	2004	FORD	2FAFP71W94X119583			2010	6	
301	2004	FORD EXPLORER	1FMZU62K94ZA31323			2010	6	
302	2004	FORD STAKE TRUCK	1FDWF36S63ED81097			2010	6	
305	2005	CHEV ASTRO VAN	1GCDM19XB5B128588			2010	5	
311	2006	FORD 350	1FDWX37PX6EC86473			2010	4	
314	2007	FORD 350	1FTWX32Y07EA77376			2010	3	
315	2007	FORD 450	1FDXF46PX7EA14358			2010	3	
317	2008	FORD 350	1FTWX32Y28EA36393			2010	2	
							14.25974	**Mean**

OTHER APPARATUSES

Light Wagon			
App	**Year**	**Make/Model**	**Description**
3002	1990	WINCO	92110
3001	1990	WINCO	92107
Trash Pumps			
2001	1968	Gorman TP1	194703444T
2002	1968	Gorman TP2	19433G4KT
2003	1968	Gorman TP3	22285L19KT
2004	1968	Gorman TP4	17137T14KG
2005	1990	Gorman Rupp	951384
2006	1993	Gorman Rupp	970335
Museum and Antique			
7	1928	Seagrave	Pumper
12	1924	Seagrave	Pumper
17	1969	LaFrance	Pumper
30	1925	Seagrave	Ladder
32	1937	Seagrave	Pumper
47	1952	Chevrolet	John Beam
68	1941	Chevrolet	Light Wagon
To Be Condemned			
64	1988	Ford van	Van
102	1985	Ford van	Van
131	1978	Seagrave	Pumper
1010	1997	SeaDoo	Jetski
4015	1999	Calkins Trailer	Trailer
149	1988	Ford LTD	Crown Vic
163	1989	Ford Victoria	Crown Vic
192	1990	Chevy	Caprice
197	1991	Chev P/U	P/U Truck
1009	1997	SeaDoo	Jetski
3004	1985	FOAM / GENER X5	
193	1990	Chevy	Caprice
191	1990	Chevy	Caprice
147	1988	Ford	Crown Vic
162	1989	Ford	Crown Vic
212	1992	Chevy	Caprice
1004	1976	Boston Whaler	Boat
4009	1993	EZ Loader	Trailer
1008	1997	Seadoo	Jetski
4014	1997	Calkins	Trailer
151	1988	Ford	Crown Vic
148	1988	Ford LTD	Crown Vic
295	1997	Chevy	Lumina
223	1993	Chevy	Caprice
303	1997	Chevy	Lumina
181	1990	Dodge	SUV
150	1988	Ford LTD	Crown Vic
190	1990	Chevy	Caprice
188	1991	Chevy	van

292	1997	Chevy	Lumina
102	1985	Ford	Van
282	1996	Ford	Bus
108	1965	Crown	Pumper
1009	1997	Seadoo	Jetski
4018	2000	Homemade	Trailer
53	1988	Chevy	P/U Truck

JET SKIS AND TRAILERS

BOATS - JETSKIS

License No.	App. No. (Unit No.)	YEAR	MAKE	VIN NO.
HA0232XC	1016	2002	Kawasaki 900STX / JETSKI	KAW80415C202
HA247XC	1018	2004	Yamaha / JETSKI	US-YAMA1080F404
HA248XC	1019	2004	Yamaha / JETSKI	US-YAMA1081F404
HA0268XC	1020	2007	Yamaha / JETSKI	US-YAMA2985C707
HA0293XC	1021	2008	Yamaha / JETSKI	US-YAMA3936K708
HA0294XC	1022	2008	Yamaha / JETSKI	US-YAMA3966K708
HA0292XC	1023	2008	Yamaha / JETSKI	US-YAMA2772K708
HA0291XC	1024	2008	Yamaha / JETSKI	US-YAMA3961K708
HA0296XC	1025	2008	Yamaha / JETSKI	US-YAMA3914K708
HA0297XC	1026	2008	Yamaha / JETSKI	US-YAMA3960K708

TRAILERS

CC321	4001	1991	CUSTOM	HFD050691HON
CC504	4012	1997	CALKIN	1CXBT1611VS701022
	4011	1997	BIG FOOT I.D. 38284	
	4013	1997	BIG FOOT I.D. 38287	
	4016	1999	BIG FOOT I.D. 43080	
CC619	4019	2000	PACE AMERICAN	40LAB202X1P067087
CC567	4020	2001	CUSTOM I.D. #46001	HFD090601HON
CC563	4021	2001	HAULMK	4XSPB12271G028547
CC597	4023	2001	CUSTOM I.D. #46877	HFD031203HON
CC588	4024	2002	CPAT TRAILER	1N9BV24222P159811
CC599	4025	2002	PACE AMERICAN	4P2UB14272U033010
CC600	4026	2002	PACE AMERICAN	4P2UB14292U033011
CC679	4027	2003	CUSTOM I.D. #49394	HFD012904HON
CC607	4028	2001	PACE AMERICAN	4P2UB14231U027915
CC623	4029	2004	CARNI TRAILER	5FMBW5K1541404956
CC626	4030	2004	CARNI TRAILER	5FMBW2J1441405516
	4031	2004	SAND TRAILER	CUSTOM MADE
	4032	2004	BURN TRAILER	VN00099702
CC663	4033	2006	EZ LOADER TRAILER	1ZEAAALC26A019064
CC687	4034	2008	EZ LOADER TRAILER	1ZEABLDA28A164145
CC688	4035	2008	EZ LOADER TRAILER	1ZEABLDA48A164146
CC689	4036	2008	EZ LOADER TRAILER	1ZEABLDA68A164147
CC690	4037	2008	EZ LOADER TRAILER	1ZEABLDA88A164148
CC692	4038	2008	EZ LOADER TRAILER	1ZEABLDA99A002840
	4039	2009	EZ LOADER TRAILER	1ZEABLDA49A008903

Annex C Weights and Dimensions for Common Equipment

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 The Fire Apparatus Manufacturers Association (FAMA) provides a worksheet for use by purchasers to calculate the portable equipment load anticipated to be carried on an apparatus. To ensure that the apparatus chassis is capable of carrying the installed equipment (pump, tank, aerial device, etc.) plus the specified portable equipment load with an appropriate margin of safety, the purchaser should use this worksheet to provide apparatus vendors with the weight of the equipment they anticipate carrying when the apparatus is placed in service.

C.1.1 The approximate measurements and weights of equipment that are commonly available and used during fire department operations are listed on the worksheet. The purchaser should fill in the number of units of each piece of anticipated equipment in the column titled "Quantity" and multiply that by the weight per unit to get the total weight. The dimensions of each piece of equipment are given to assist in planning compartment size or the location on the fire apparatus. Where the purchaser wants to carry specific equipment in a specific compartment, that compartment designation should be shown in the column titled "Compartment Location."

C.1.2 The worksheet can be downloaded as an Excel spreadsheet from the FAMA website, *www.fama.org*, and customized to show only the equipment a department expects to carry. There are additional columns on the spreadsheet to assist the fire department in maintaining records of the equipment it carries on the apparatus.

Annex D Guidelines for First-Line and Reserve Fire Apparatus

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 General. To maximize fire fighter capabilities and minimize risk of injuries, it is important that fire apparatus be equipped with the latest safety features and operating capabilities. In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus manufactured prior to 1991 usually included only a few of the safety upgrades required by the recent editions of the NFPA fire department apparatus standards or the equivalent Underwriters' Laboratories of Canada (ULC) standards. Because the changes, upgrades, and fine tuning to NFPA 1901, *Standard for Automotive Fire Apparatus*, have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to fire fighters of keeping fire apparatus older than 15 years in first-line service.

It is recommended that apparatus greater than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status and upgraded in accordance with NFPA 1912, *Standard for Fire Apparatus Refurbishing*, to incorporate as many features as possible of the current fire apparatus standard *(see Section D.3)*. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many of the improvements and upgrades required by the recent versions of the standards are available to the fire fighters who use the apparatus.

Apparatus that were not manufactured to the applicable NFPA fire apparatus standards or that are over 25 years old should be replaced.

D.2 How the Standards Have Changed. It is a generally accepted fact that fire apparatus, like all types of mechanical devices, have a finite life. The length of that life depends on many factors, including vehicle mileage and engine hours, quality of the preventative maintenance program, quality of the driver training program, whether the fire apparatus was used within the design parameters, whether the apparatus was manufactured on a custom or commercial chassis, quality of workmanship by the original manufacturer, quality of the components used, and availability of replacement parts, to name a few.

In the fire service, there are fire apparatus with 8 to 10 years of service that are simply worn out. There are also fire apparatus that were manufactured with quality components, that have had excellent maintenance, and that have responded to a minimum number of incidents that are still in serviceable condition after 20 years. Most would agree that the care of fire apparatus while being used and the quality and timeliness of maintenance are perhaps the most significant factors in determining how well a fire apparatus ages.

Prior to 1991, NFPA 1901 was basically a "reactive standard." If something worked well in field use for a few years, it might have been suggested for inclusion in NFPA 1901. It was a very basic standard. In the late 1980s, the Technical Committee on Fire Department Apparatus decided to become proactive and to greatly enhance the value of the standard for the fire service. Task groups were appointed to develop reasonable requirements for the various components that made up a fire apparatus, and a safety task group was charged with looking at issues across the board that would improve the safety of fire fighters who use the apparatus.

The completely revised 1991 editions of the NFPA fire department apparatus standards were the result of those efforts and the full committee's strong desire to make the automotive fire apparatus standards not only more safety oriented but also more user friendly.

Contained within the 1991 edition of the fire department apparatus standards were requirements for such items as fully enclosed riding areas with reduced noise (dBA) levels to keep crew members safe and informed, seats and seat belts for all crew members riding on the apparatus, fail-safe door handles so the sleeve of a coat did not inadvertently catch a handle and open a door, and signs requiring everyone to be seated and belted. Also included were increased battery capacity to ensure starting under most conditions; improved warning lights, including intersection lights for increased visibility; removal of all roof-mounted audible warning devices to reduce hearing problems; a flashing light in the cab to warn if a cab or body door is open; a backup alarm; an automatic transmission to make it easier to drive (unless the purchaser has a specific reason for a manual transmission); auxiliary braking systems; and reflective striping.

The tip load for an aerial ladder was required to have a minimum carrying capacity of 250 lb (114 kg) when the aerial ladder was at zero degrees elevation and maximum extension. Other requirements, such as a minimum rail height, the minimum design strength of the rungs, and a minimum load-carrying requirement for folding steps, were added to make the aerial ladder safer for fire fighters to use. Where a water

tower was equipped with a ladder, the same requirements that applied to an aerial ladder were required of the ladder on the water tower.

The carrying capacity of elevating platforms at zero degrees elevation and maximum extension was raised to 750 lb (340 kg). Elevating platforms were also required to have handrails, breathing air available in the platform (with low-air warning capability) for at least two fire fighters, and a water curtain cooling system under the platform.

All aerial devices had to be capable of supporting a static load of one and one-half times their rated capacity in any position. A requirement for a stabilizer movement alarm and reflective striping with warning lights was added. Interlocks to prevent inadvertent movement to an unsupported side and to prevent raising the aerial device prior to the stabilizers being deployed were specified. One hundred percent nondestructive tests (NDT) became a requirement. All these requirements were included in the 1991 editions of the NFPA fire department apparatus standards

In the pump area, the standard specified that 3 in. (75 mm) or larger valves be "slow close," that caps on intakes and discharge outlets be tested to 500 psi (3400 kPa), that an intake relief valve be provided to help manage incoming pressure, that 30-degree sweep elbows be provided on the discharges to eliminate hose kinking, and that all 3 in. (75 mm) and larger discharges be eliminated from the pump panel to reduce the possibility of injuries to the pump operator.

Fire apparatus equipped with electronic or electric engine throttle controls were required to include an interlock system to prevent engine speed advancement, unless the chassis transmission was in neutral with the parking brake engaged or unless the parking brake was engaged, the fire pump was engaged, and the chassis transmission was in the correct pumping gear.

The 1991 editions have been recognized as the benchmark from which improved and safer fire apparatus have evolved.

In 1996, many requirements were added throughout the document to improve the safety for fire fighters using the apparatus. These requirements included limiting the height of controls to 72 in. (1830 mm) above the standing position of the operator, requiring equipment in driving and crew areas to be securely fastened or in a compartment, increasing work lighting around the apparatus, and better grouping of pump controls to keep the operator away from the intake and discharge outlets. The low voltage electrical chapter was totally rewritten to require load analysis and load management if the total connected load could not be supplied by the vehicle's alternator. The requirements for warning lights were also rewritten to provide for different lighting for "calling for right-of-way" versus "blocking right-of-way." Requirements for warning lights were increased to provide more visibility of the fire apparatus.

The 1999 edition of NFPA 1901 added requirements to further increase the safety for the users. In the body area, the minimum step surface size, slip resistance, and load-carrying capabilities were increased. Handrails were required to be slip resistant, and reflective striping was required on all four sides of the apparatus. To ensure the capability for continuous operation at fire scenes, a 2-hour, maximum load electrical test for line voltage systems was implemented.

The 1999 standard also required more secure mounting of equipment in the driving and crew compartment, minimum performance and pre-delivery testing of foam systems, and design of fill stations for breathing air cylinders to totally contain a rupturing cylinder.

The 2003 edition continued to refine the requirements in the driving and crew riding areas, increasing the head height at seating positions, bright-red seat belts, reflective material inside each cab door, automatic door-open lights, and more secure mounting of SCBAs in seat backs, all aimed at reducing fire fighter injuries. The test protocol for slip resistance of standing and walking surfaces was better defined. Because of the size of emergency vehicles, a label was required to remind operators of the height, length, and weight of the apparatus.

D.3 Upgrading Fire Apparatus. Any apparatus, whether in first-line or reserve service, should be upgraded in accordance with NFPA 1912, as necessary, to ensure that the following features are included as a minimum:

(1) Fully enclosed seating is provided for all members riding on the fire apparatus.
(2) Warning lights meet or exceed the current standard.
(3) Reflective striping meets or exceeds the current standard.
(4) Slip resistance of walking surfaces and handrails meets the current standard.
(5) A low-voltage electrical system load manager is installed if the total connected load exceeds the alternator output.
(6) The alternator output is capable of meeting the total continuous load on the low voltage electrical system.
(7) Where the gross vehicle weight rating (GVWR) is 36,000 lb (16,000 kg) or more, an auxiliary braking system is installed and operating correctly.
(8) Ground and step lighting meets or exceeds the current standard.
(9) Noise levels in the driving and crew compartment(s) meet the current standard, or appropriate hearing protection is provided.
(10) All horns and sirens are relocated to a position as low and as far forward as possible.
(11) Seat belts are available for every seat and are new or in serviceable condition.
(12) Signs are present stating that no riding is allowed on open areas.
(13) A pump shift indicator system is present and working properly for vehicles equipped with an automatic chassis transmission.
(14) For vehicles equipped with electronic or electric engine throttle controls, an interlock system is present and working properly to prevent engine speed advancement at the operator's panel, unless either the chassis transmission is in neutral with the parking brake engaged, or the parking brake is engaged, the fire pump is engaged, and the chassis transmission is in pumping gear.
(15) All loose equipment in the driving and crew areas is securely mounted to prevent its movement in case of an accident.

D.4 Proper Maintenance of Fire Apparatus. In addition to needed upgrades to older fire apparatus, it is imperative that all fire apparatus be checked and maintained regularly to ensure that they will be reliable and safe to use. The manufacturer's instructions should always be followed when maintaining the fire apparatus. Special attention should be paid to ensure that the following conditions, which are particularly critical to maintaining a reliable unit exist:

(1) Engine belts, fuel lines, and filters have been replaced in accordance with the manufacturers' maintenance schedule(s).