

Houston Firefighters' Relief and Retirement Fund

Actuarial Valuation Report
As of July 1, 2015

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Summary of Key Results (\$000)

July 1, 2015

Actuarial Contribution Rate

· Normal Cost (City Portion)	19.5%
· Amortization of Unfunded Actuarial Accrued Liability (Surplus)	11.3
· Additional Statutory Requirement	<u>0</u>
· City's Actuarial Contribution Rate	30.8%
· Employee Contribution Rate	9.0%

Summary of Assets

· Market Value	\$ 3,877,651
<i>Rate of Return</i>	1.3%
· Actuarial Value ⁽¹⁾	\$ 3,929,988
<i>Rate of Return</i>	9.3%

Summary of Liabilities

· Actuarial Accrued Liability	\$ 4,397,007
· Actuarial Value of Assets	<u>\$ (3,929,988)</u>
· Unfunded Actuarial Accrued Liability	\$ 467,019
· Funded Ratio	89.4%

Summary of Data

Number of Participants Included in the Valuation

Active Participants	3,142
DROP Participants	796
Retirees and beneficiaries	3,060
Vested terminated participants	<u>23</u>
Total	7,021

Projected Annual Payroll

Active Participants	\$ 221,668
DROP Participants	<u>70,821</u>
Total	\$ 292,489

(1) Past gains and losses were fully recognized in the Actuarial Value of Assets at July 1, 2013.

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Summary of Market Value of Assets (\$000)

Investment Category	<u>July 1, 2015</u>		<u>July 1, 2014</u>		<u>July 1, 2013</u>	
	Amount	Percent	Amount	Percent	Amount	Percent
Cash & Short Term Investments	\$ 163,566	4.2%	\$ 127,736	2.6%	\$ 105,737	3.1%
Fixed Income Investments	1,216,922	31.4%	1,220,890	34.6%	1,123,763	32.9%
Equity Securities	1,503,799	38.8%	1,557,858	36.2%	1,378,698	40.2%
Other Assets						
Alternative Investments - Partnerships	808,707	20.9%	812,356	19.5%	618,511	18.0%
Real Estate	171,053	4.4%	195,472	6.6%	189,252	5.5%
Land, Building, etc.	5,659	0.1%	5,950	0.2%	6,990	0.2%
Other Net Assets, Receivables & Payables:						
Accrued Interest & Dividends	16,984	0.4%	16,457	0.5%	17,507	0.5%
Accrued City Contributions	2,828	0.1%	2,474	0.0%	1,591	0.0%
Accrued Member Contributions	769	0.0%	671	0.0%	599	0.0%
Net Other	<u>(12,636)</u>	(0.3)%	<u>(27,039)</u>	(0.2)%	<u>(12,211)</u>	(0.4)%
Total Market Value of Assets	\$ 3,877,651	100.0%	\$ 3,912,825	100.0%	\$ 3,430,437	100.0%

Change in Market Value Assets

	Fiscal Year End June 30, 2015	Fiscal Year End June 30, 2014
1. Beginning of Year Market Value	\$ 3,912,825,278	\$ 3,430,436,708
2. Increases Due to:		
a. Contributions:		
i. City	\$ 92,609,565	\$ 64,337,994
ii. Members	<u>25,091,582</u>	<u>23,993,560</u>
iii. Total	\$ 117,701,147	\$ 88,331,554
b. Investment Income	<u>\$ 51,802,139</u>	<u>\$ 589,517,944</u>
c. Total Increases	\$ 169,503,286	\$ 677,849,498
3. Decreases Due to:		
a. Benefit Payments	\$ 195,493,351	\$ 186,332,755
b. Refund of Member Contributions	868,618	784,927
c. Administrative Expenses	6,640,148	6,884,474
d. Professional Services	<u>1,675,931</u>	<u>1,458,772</u>
e. Total Decreases	\$ 204,678,048	\$ 195,460,928
4. End of Year Market Value	\$ 3,877,650,516	\$ 3,912,825,278

Development of the Actuarial Value of Assets (\$000)

Actuarial Investment Gain (Loss)

	Fiscal Year End June 30, 2015	Fiscal Year End June 30, 2014
1. Market Value of Assets at beginning of year	\$ 3,912,825	\$ 3,430,437
2. 2014/2015 Net Cash Flow		
a. Contributions	\$ 117,701	\$ 88,332
b. Disbursements	<u>196,362</u>	<u>187,118</u>
c. Net Cash Flow	\$ (78,661)	\$ (98,786)
2.a.- 2.b.		
3. Expected Investment Return [1. x .085] + [2.c. x .0425]	\$ 329,247	\$ 287,389
4. Expected Market Value of Assets at end of year 1. + 2.c. + 3.	\$ 4,163,411	\$ 3,619,040
5. Market Value of Assets at end of year	\$ 3,877,651	\$ 3,912,825
6. Investment Gain / (Loss) 5. - 4.	\$ (285,760)	\$ 293,785

Development of the Actuarial Value of Assets (\$000) (continued)

Schedule of Actuarial Investment Gains (Losses)

Plan Year Ending	Initial Actuarial Gain (Loss)	Five-Year Recognition	Unrecognized Gain (Loss)* As of July 1, 2015
July 1, 2015	\$ (285,760)	\$ (57,152)	\$ (228,608)
July 1, 2014	\$ 293,785	\$ 58,757	\$ 176,271

Actuarial Value of Assets

1. Market Value as of July 1, 2015	\$ 3,877,651
2. (Gain) Loss to be Recognized in Future Years	\$ 52,337
3. Actuarial Value as of July 1, 2015	\$ 3,929,988

* Past gains and losses were fully recognized in the Actuarial Value of Assets at July 1, 2013. For 2013, the Actuarial Value of Assets is equal to the Market Value of Assets. Starting in July 1, 2014, assets gains and losses are deferred for recognition in future years.

Unfunded Actuarial Accrued Liability (\$000)

July 1, 2015

Actuarial Present Value of:

Future Benefits

Active	\$	1,380,606
DROP		1,079,558
Deferred Vested		1,869
Retired		<u>2,711,549</u>
Total for All Participants	\$	5,173,582

Future Employee Contributions \$ 235,139

Future Normal Cost - City Portion \$ 541,436

Actuarial Accrued Liability \$ 4,397,007

Actuarial Value of Assets \$ (3,929,988)

Unfunded Actuarial Accrued Liability \$ 467,019

Total Normal Cost (BOY) \$ 79,670

Actuarially Determined City Contribution Rates

	Actuarial Valuation as of July 1, 2015
1. Normal Cost (City Portion)	19.5 %
2. Amortization of Unfunded Actuarial Accrued Liability (Surplus)	11.3 %
3. Additional Statutory Requirement	<u>0.0</u>
4. City's Contribution Rate	30.8 %
5. Employee Contribution Rate	9.0 %

Analysis of Actual Contribution Rates

	Contribution Rate	
	<u>City</u>	<u>Employee</u>
Fiscal Year 2009	29.4%	9.0%
Fiscal Year 2010	29.4%	9.0%
Fiscal Year 2011	29.4%	9.0%
Fiscal Year 2012	23.9%	9.0%
Fiscal Year 2013	23.9%	9.0%
Fiscal Year 2014	23.9%	9.0%
Fiscal Year 2015	33.2%	9.0%

Historical City Contributions as a Percentage of Covered Payroll

Actuarially Calculated City Contribution Rate ⁽¹⁾		Actual City Contribution Rate	
Valuation Date	Rate	Period	Rate
July 1, 1987	13.0%	July 1, 1988 through June 30, 1989	15.0%
July 1, 1988	13.3	July 1, 1989 through June 30, 1990	15.0
July 1, 1989	12.9	July 1, 1990 through June 30, 1991	15.0
July 1, 1990	13.2	July 1, 1991 through June 30, 1992	15.0
July 1, 1991	15.4	July 1, 1992 through June 30, 1993	15.0 ⁽²⁾
July 1, 1992	15.3	July 1, 1993 through June 30, 1994	15.3
July 1, 1993	15.6	July 1, 1994 through June 30, 1995	15.0
July 1, 1994	14.9	July 1, 1995 through June 30, 1996	15.0
July 1, 1995	13.4 ⁽³⁾	July 1, 1996 through June 30, 1997	15.4
July 1, 1996	14.1 ⁽³⁾	July 1, 1997 through June 30, 1998	15.4
July 1, 1997	14.9 ⁽³⁾	July 1, 1998 through June 30, 1999	15.4
July 1, 1998	11.5	July 1, 1999 through June 30, 2000	15.4
July 1, 1999	11.0	July 1, 2000 through June 30, 2001	15.4
July 1, 2000	9.9 ⁽³⁾	July 1, 2001 through June 30, 2002	15.4
July 1, 2001	14.9 ⁽³⁾	July 1, 2002 through June 30, 2003	15.4
July 1, 2002	23.8	July 1, 2003 through June 30, 2004	16.5 ⁽³⁾
July 1, 2003	N/A ⁽⁴⁾	July 1, 2004 through June 30, 2005	18.0
July 1, 2004	31.1	July 1, 2005 through June 30, 2006	23.8
July 1, 2005	33.5	July 1, 2006 through June 30, 2007	23.8
July 1, 2006	32.7	July 1, 2007 through June 30, 2008	23.8
July 1, 2007	29.4	July 1, 2008 through June 30, 2009	29.4
July 1, 2008	24.1	July 1, 2009 through June 30, 2010	29.4
July 1, 2009	23.8	July 1, 2010 through June 30, 2011	29.4
July 1, 2010	23.9	July 1, 2011 through June 30, 2012	23.9
July 1, 2011	26.9	July 1, 2012 through June 30, 2013	23.9
July 1, 2012	31.1	July 1, 2013 through June 30, 2014	23.9
July 1, 2013	33.2	July 1, 2014 through June 30, 2015	33.2
July 1, 2014	N/A ⁽⁴⁾	July 1, 2015 through June 30, 2016	33.2
July 1, 2015	30.8	July 1, 2016 through June 30, 2017	TBD

⁽¹⁾ Before application of statutory minimum contribution.

⁽²⁾ Excluding additional contribution due to settlement of lawsuit.

⁽³⁾ Average for the year.

⁽⁴⁾ No valuation performed.

Participant Data Reconciliation

	<u>Active</u>	<u>Deferred</u>		<u>Total</u>	
		<u>DROP</u>	<u>Vested</u>		<u>Retired</u>
1.Number of members as of July 1, 2014	3,041	785	16	2,998	6,840
2.Change in status during the plan year:					
a. Actives who retired	(2)	(84)		86	0
b. Actives who terminated	(11)		11		0
c. Actives who entered D.R.O.P.	(100)	100			0
d. Inactives who retired					
e. Participants who became disabled	(6)	(2)	(1)	9	0
3.No longer members due to:					
a. Death	(2)	(3)		(71)	(76)
b. Nonvested terminations	(4)				(4)
c. Child attained cut-off age				(10)	(10)
d. Benefits no longer due	(16)		(3)	(4)	(23)
4.New member due to:					
a. Initial membership	245			14	259
b. Death of another member				35	35
c. Correction	(3)			3	0
5.Number of members as of July 1, 2015	3,142	796	23	3,060	7,021

Summary of DROP Participants as of July 1, 2015

Attained Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total
Under 25	0	0	0	0	0	0	0	0	0	0	0
Avg. Pay	0	0	0	0	0	0	0	0	0	0	0
25 to 29	0	0	0	0	0	0	0	0	0	0	0
Avg. Pay	0	0	0	0	0	0	0	0	0	0	0
30 to 34	0	0	0	0	0	0	0	0	0	0	0
Avg. Pay	0	0	0	0	0	0	0	0	0	0	0
35 to 39	0	0	0	0	0	0	0	0	0	0	0
Avg. Pay	0	0	0	0	0	0	0	0	0	0	0
40 to 44	0	0	0	0	0	23	5	0	0	0	28
Avg. Pay	0	0	0	0	0	83,107	87,383	0	0	0	83,871
45 to 49	0	0	0	0	0	104	57	0	0	0	161
Avg. Pay	0	0	0	0	0	82,004	87,455	0	0	0	83,934
50 to 54	0	0	0	0	0	96	110	98	0	0	304
Avg. Pay	0	0	0	0	0	81,250	84,870	85,908	0	0	84,061
55 to 59	0	0	0	0	0	26	37	155	52	2	272
Avg. Pay	0	0	0	0	0	79,805	83,611	85,362	86,818	87,935	84,890
60 to 64	0	0	0	0	0	0	0	16	10	2	28
Avg. Pay	0	0	0	0	0	0	0	81,310	89,293	75,392	83,738
65 to 69	0	0	0	0	0	0	0	0	0	2	2
Avg. Pay	0	0	0	0	0	0	0	0	0	91,359	91,359
70 & up	0	0	0	0	0	0	0	0	0	1	1
Avg. Pay	0	0	0	0	0	0	0	0	0	109,347	109,347
Total	0	0	0	0	0	249	209	269	62	7	796
Avg. Pay	0	0	0	0	0	81,585	85,412	85,320	87,217	88,388	84,351
Average Age:			52.73			Average Service:			28.59		

Summary of Active and DROP Participants as of July 1, 2015

Attained Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total
Under 25	21	49	0	0	0	0	0	0	0	0	70
Avg. Pay	7,614	49,048	0	0	0	0	0	0	0	0	36,618
25 to 29	81	266	82	1	0	0	0	0	0	0	430
Avg. Pay	9,070	48,891	65,120	74,491	0	0	0	0	0	0	44,544
30 to 34	55	198	298	145	0	0	0	0	0	0	696
Avg. Pay	9,189	49,336	66,253	73,003	0	0	0	0	0	0	58,337
35 to 39	8	57	205	520	22	0	0	0	0	0	812
Avg. Pay	10,561	52,992	65,729	71,685	81,239	0	0	0	0	0	68,526
40 to 44	0	3	84	358	169	89	5	0	0	0	708
Avg. Pay	0	63,273	67,042	72,390	82,406	87,168	87,383	0	0	0	76,071
45 to 49	0	0	2	128	151	177	64	0	0	0	522
Avg. Pay	0	0	63,447	72,305	81,641	84,062	88,823	0	0	0	80,984
50 to 54	0	0	0	3	48	128	112	99	0	0	390
Avg. Pay	0	0	0	73,699	83,793	81,767	84,716	85,730	0	0	83,807
55 to 59	0	0	0	0	0	32	37	155	53	2	279
Avg. Pay	0	0	0	0	0	80,108	83,611	85,362	86,636	87,935	84,788
60 to 64	0	0	0	0	0	0	0	16	10	2	28
Avg. Pay	0	0	0	0	0	0	0	81,310	89,293	75,392	83,738
65 to 69	0	0	0	0	0	0	0	0	0	2	2
Avg. Pay	0	0	0	0	0	0	0	0	0	91,359	91,359
70 & up	0	0	0	0	0	0	0	0	0	1	1
Avg. Pay	0	0	0	0	0	0	0	0	0	109,347	109,347
Total	165	573	671	1,155	390	426	218	270	63	7	3,938
Avg. Pay	8,997	49,542	66,045	72,145	82,215	83,724	85,795	85,257	87,058	88,388	69,343
Average Age:			40.05				Average Service:			13.62	

Historical Active and DROP Participant Data

Valuation Date	Number of Participants	Average Age	Projected Annual Payroll (\$000)	Average Annual Salary	Percentage Increase in Average Salary
January 1, 1976	2,262	33.0	34,600	15,318	31.2%
January 1, 1978	2,158	33.5	40,200	18,639	21.7
January 1, 1980	2,543	32.5	49,900	19,646	5.4
January 1, 1982	2,942	32.5	73,844	25,100	27.8
July 1, 1984	3,204	34.0	86,068	26,863	7.0
July 1, 1986	3,167	33.7	99,619	31,455	17.1
July 1, 1987	3,164	35.3	99,837	31,554	0.3
July 1, 1988	3,023	36.1	96,051	31,774	0.7
July 1, 1989	2,967	36.7	98,091	33,061	4.1
July 1, 1990	2,926	37.1	97,633	33,367	0.9
July 1, 1991	2,969	37.6	104,350	35,147	5.3
July 1, 1992	2,913	38.3	102,360	35,139	0.0
July 1, 1993	2,958	38.6	119,503	40,400	15.0
July 1, 1994	2,945	39.2	120,082	40,775	0.9
July 1, 1995	3,084	39.2	126,977	41,173	1.0
July 1, 1996	3,039	40.1	131,641	43,317	5.2
July 1, 1997	3,202	40.2	141,949	44,331	2.3
July 1, 1998	3,229	40.9	149,045	46,158	4.1
July 1, 1999	3,282	41.4	158,965	48,435	4.9
July 1, 2000	3,271	42.1	163,630	50,024	3.3
July 1, 2001	3,318	42.1	164,315	49,522	(1.0)
July 1, 2002	3,375	41.8	190,578	56,468	14.0
July 1, 2004	3,656	40.4	181,526	48,206	(14.6)
July 1, 2005	3,894	39.4	192,084	49,358	2.4
July 1, 2006	3,796	41.2	218,746	52,731	6.8
July 1, 2007	3,819	40.5	232,397	57,581	9.2
July 1, 2008	3,876	40.2	239,172	59,909	4.0
July 1, 2009	3,949	40.3	258,949	61,053	1.9
July 1, 2010	3,911	40.5	265,836	63,296	3.7
July 1, 2011	3,861	40.5	272,462	65,712	3.8
July 1, 2012	3,788	40.8	270,873	66,631	1.0
July 1, 2013	3,745	40.4	271,828	67,746	1.2
July 1, 2014	3,826	40.6	278,166	70,586	4.2
July 1, 2015	3,938	40.1	292,489	69,343	(1.8)

Summary of Inactive Participants as of July 1, 2015

	Number	Annual Benefits (\$000)	Average Annual Benefits
• Benefits in Pay Status			
— Retirees	2,160	\$ 103,826	\$ 48,068
— Beneficiaries	578	21,657	37,533
— Disabled Participants	<u>322</u>	<u>15,146</u>	<u>47,039</u>
— Total	3,060	\$ 140,629	\$ 45,957
• Deferred Benefits			
— Vested Terminated Participants	23	\$ 170	\$ 7,406
— Beneficiaries	N/A	N/A	N/A
— Disabled Participants	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
— Total	23	\$ 170	\$ 7,406

Retirees and Beneficiaries Added to and Removed from Rolls

Period Ended	Added to Rolls		Removed from Rolls		Rolls at the End of the Year		Percentage Increase in Annual Benefits	Average Annual Benefit
	Number	Annual Benefits (\$000)	Number	Annual Benefits (\$000)	Number	Annual Benefits (\$000)		
December 31, 1978	72	719	23	76	794	4,294	15.8%	5,408
December 31, 1979	67	719	21	83	840	5,008	16.6	5,962
December 31, 1980	33	473	23	84	850	5,498	9.8	6,468
December 31, 1981	61	862	38	159	873	6,097	10.9	6,983
December 31, 1982	63	644	26	171	910	6,772	11.1	7,442
December 31, 1983	54	605	39	207	925	7,403	9.3	8,003
June 30, 1984*	41	619	17	98	949	3,952	6.8	8,328
June 30, 1985	75	968	53	290	971	8,432	6.7	8,684
June 30, 1986	54	752	38	243	987	9,550	13.3	9,676
June 30, 1987	76	1,101	33	235	1,030	10,522	10.2	10,215
June 30, 1988	121	2,002	38	311	1,113	12,754	21.2	11,459
June 30, 1989	74	1,306	42	299	1,145	14,032	10.0	12,255
June 30, 1990	111	1,996	37	288	1,219	16,428	17.1	13,477
June 30, 1991	129	1,784	38	401	1,310	17,888	8.9	13,665
June 30, 1992	78	1,588	44	401	1,344	19,866	11.1	14,781
June 30, 1993	82	1,717	48	585	1,378	21,516	8.3	15,614
June 30, 1994	112	2,006	58	660	1,432	23,297	8.3	16,269
June 30, 1995	87	1,728	28	353	1,491	25,142	7.9	16,863
June 30, 1996	67	1,402	56	660	1,502	26,379	4.9	17,563
June 30, 1997	56	1,050	37	487	1,521	27,581	4.6	18,133
June 30, 1998	54	1,064	43	477	1,532	28,675	4.0	18,717
June 30, 1999	64	1,840	28	551	1,568	30,233	5.4	19,281
June 30, 2000	95	2,364	71	1,167	1,592	34,583	14.4	21,723
June 30, 2001	127	3,581	47	775	1,672	38,347	10.9	22,935
June 30, 2002	172	5,493	61	998	1,783	44,300	15.5	24,846
June 30, 2004**	377	N/A	109	N/A	2,051	57,676	30.2	28,121
June 30, 2005	135	4,353	53	1,107	2,133	62,882	9.0	29,481
June 30, 2006	195	7,231	60	1,437	2,268	70,420	12.0	31,050
June 30, 2007	106	3,822	59	1,407	2,315	74,948	6.4	32,375
June 30, 2008	166	9,334	21	828	2,460	98,216	31.0	39,925
June 30, 2009	133	3,369	43	2,081	2,550	94,536	-3.7	37,073
June 30, 2010	162	7,159	103	2,886	2,609	96,580	2.2	37,018
June 30, 2011	181	8,905	64	1,489	2,726	106,832	10.6	39,190
June 30, 2012	141	7,042	77	2,398	2,790	114,176	6.8	40,923
June 30, 2013	170	8,286	54	1,837	2,906	124,080	8.7	42,698
June 30, 2014	162	7,772	70	1,401	2,998	132,749	7.0	44,279
June 30, 2015	147	7,273	85	383	3,060	140,629	5.9	45,957

* Six-month period **Two-year period

Summary of Actuarial Methods and Assumptions

Basis for Assumptions

The economic and demographic assumptions used in the valuation were adopted by the Board in consultation with Buck Consultants. The Board's established practice is to review the experience of the Retirement System at least once every five years to determine if any changes to the valuation assumptions are warranted. In general, the assumptions used in the valuation are based on recommendations made and approved by the Board as part of an Experience Study covering plan years from July 1, 2009 through June 30, 2013. In addition, the Board reviewed the investment rate of return assumption of 8.50% in November of 2015 based on a long term capital market simulation analysis reflecting the investment policy adopted by the Board in June of 2015.

Actuarial Methods

Actuarial Value of Assets

Gains and losses in the market value of assets, based on the difference between the actual rate of return and the assumed rate of return, are recognized in the actuarial value over five years. Past gains and losses were fully recognized in the Actuarial Value of Assets at July 1, 2013. New gains and losses will be recognized over five years beginning July 1, 2014.

Actuarial Cost Method

Entry Age Method with liabilities allocated from date of entry to expected payment of benefit. The Unfunded Actuarial Accrued Liability (Surplus), including the effects of actuarial gains and losses, is amortized as a level percentage of payroll over 30 Years beginning July 1, 2015. The contribution is increased for interest for one-half of a year to reflect timing of payment.

Summary of Actuarial Methods and Assumptions (continued)

KEY ECONOMIC ASSUMPTIONS

Investment Return

Real Rate of Return	5.5%
Price Inflation	<u>3.0%</u>
Total Nominal Rate	8.5%

Expected future investment returns are assumed to be net of administrative and investment expenses.

<u>Wage and Price Inflation</u>	3.0%
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<u>Payroll Growth Rate</u>	3.0%
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Individual Pay Increase Rate

<u>Age</u>	(Nominal = Merit + Wage Inflation)	
	<u>Nominal</u>	<u>Merit</u>
20	7.00%	4.00%
25	6.25%	3.25%
30	5.50%	2.50%
35	5.00%	2.00%
40	4.00%	1.00%
45	3.70%	0.70%
50	3.40%	0.40%
55	3.00%	0.00%

Summary of Actuarial Methods and Assumptions (continued)

Demographic Assumptions

Retirement Rates

Number of Years of Service	Probability of Retiring Within One Year
20	1%
21	1%
22	1%
23	1%
24	1%
25	5%
26	5%
27	5%
28	5%
29	5%
30	15%
31	15%
32	15%
33	15%
34	15%
35	25%
36	25%
37	30%
38	35%
39	40%
40+	100%

Summary of Actuarial Methods and Assumptions (continued)

Demographic Assumptions

DROP Duration	Duration of DROP at Retirement	Percentage of Participants Electing Retirement at the Specified Duration
	0	0%
	3	0
	5	5
	8	30
	10	65

Sample Rates	Number of Years of Service at Actual Retirement	Percentage of Participants Retiring with Specific Drop Durations				
		0 yr	3 yrs	5 yrs	8 yrs	10 yrs
	20	0%	0%	0%	0%	0%
	25	0	0	100	0	0
	30	0	0	5	30	65
	35	0	0	5	30	65
	40+	0	0	0	0	100

Summary of Actuarial Methods and Assumptions (continued)

Mortality Rates

Active participants and nondisabled pensioners

RP-2000 Table projected to year 2025 using Scale AA.

Note: The RP-2000 Mortality Table projected to year 2025 using scale AA is used to determine the mortality assumptions for the plan, including the probability of ceasing active service due to death.

Disabled pensioners

Graduated rates (see table below for sample rates).

Disability Rates

Graduated rates (see table below for sample rates).

Percentage of Deaths and Disabilities in the Line of Duty

<u>Age</u>	<u>Death</u>	<u>Disability*</u>
25	100%	60%
35	100	60
45	42	34
55	20	25

* 1% of firefighters who become disabled in the line of duty are assumed to be incapable of performing any substantial gainful activity.

Termination Rates

<u>Age</u>	<u>Termination Rate</u>
20	1.30%
25	1.30
30	1.18
35	0.70
40	0.40
45	0.45
50	0.00

For participants terminating with at least 10 years but less than 20 years of service:

- 50% will elect a contribution refund
- 50% will elect a deferred monthly pension benefit

Marital Status at Benefit Eligibility

Percentage married

- 90% of participants are assumed to be married.
- No beneficiaries other than the spouse assumed.

Age difference

- Husbands assumed to be three years older than wives.

Summary of Actuarial Methods and Assumptions (continued)

- | | |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Load of Nature of Average Monthly Salaries | <ul style="list-style-type: none"> Active liabilities and normal costs were increased 5% to account for differences between the plan's definition of average monthly salary (average of the highest 78 pay periods), and the average of the final 78 pay periods. |
| Development of Valuation Pay | <ul style="list-style-type: none"> Valuation pay is developed by increasing the prior year's pay with the nominal individual pay increase rate. |
| Age at which Benefits End for Child Beneficiaries | <ul style="list-style-type: none"> Benefits are assumed to end once the child beneficiary reaches age 23. |

Missing Data Assumptions

- | | |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pay for New Hires | None were missing. |
| Employee Contributions | Based on the prior year's contributions and current year's pay. |
| Age at First Payment for Vested Terminations: | 50 |
| Benefits Not Valued | The proportional retirement program between the Houston municipal, police and fire pension funds which allows for combining service credit from two or more City of Houston pension plans was not valued because its impact is expected not to be material. |

Sample Rates

<i>Sample Rates per 100 Participants</i>						
<i>Age</i>	<i>Non-disabled Mortality</i>		<i>Disabled Mortality</i>		<i>Disability</i>	
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>All</i>	
20	0.03	0.02	2.30	0.70	0.75	
25	0.04	0.02	2.60	1.30	0.75	
30	0.04	0.03	2.90	1.90	0.75	
35	0.07	0.05	2.80	2.20	1.50	
40	0.10	0.07	3.10	2.30	1.50	
45	0.15	0.11	3.50	2.30	1.50	
50	0.21	0.17	4.10	2.60	1.50	
55	0.36	0.27	5.30	3.00	1.50	
60	0.67	0.50	6.50	3.40	3.00	

Changes in Assumptions and Methods Since the Prior Year

The following changes in assumptions and methods have taken place since the July 1, 2013 valuation:

In general, the mortality rates applicable to active and non-disabled participants are based on the RP-2000 table projected 10 years from the valuation date. Therefore, the mortality rates have been updated from the RP-2000 table projected to 2023 using scale AA to the RP-2000 table projected to 2025 using Scale AA. This increased the actuarial accrued liability by \$2.5M.

Past gains and losses were fully recognized in the Actuarial Value of Assets at July 1, 2013. New gains and losses will be recognized over five years beginning July 1, 2014.

The funding policy was changed to amortize the Unfunded Actuarial Accrued Liability (Surplus), including the effects of actuarial gains and losses, as a level percentage of payroll over 30 Years beginning July 1, 2015.

Summary of Plan Provisions

Membership	Any firefighter who has not reached the age of 36 at the time he or she first enters employment shall automatically become a participant in the Fund upon completing the training period. Before October 1, 1990, the eligibility age was age 31. Before 1984, participants entered the Fund on January 1 or July 1.
Average Salary	The average of the highest 36 months of salary (or 78 pay periods), including base pay and overtime, before reduction for pre-tax employee contributions and salary deferrals.
Standard Service Pension	
Eligibility	20 years of service
Benefit	<p>For retirement on or after November 1, 1997, 50% of average monthly salary; plus 3% of average monthly salary per year of service in excess of 20 years.</p> <p>For retirement on or after November 1, 1996 and prior to November 1, 1997, 48.334% of average monthly salary, plus 2.834% of average monthly salary per year of service in excess of 20 years.</p> <p>For retirement on or after November 1, 1995 and prior to November 1, 1996, 46.667% of average monthly salary, plus 2.667% of average monthly salary per year of service in excess of 20 years.</p> <p>For retirement on or after September 1, 1991 and prior to November 1, 1995, 45% of average monthly salary, plus 2.5% of average monthly salary per year of service in excess of 20 years, up to 30 years, plus 1.0% of average monthly salary in excess of 30 years.</p> <p>For retirement on or after September 1, 1989 and prior to September 1, 1991, 45% of average monthly salary, plus 2.5% of average monthly salary per year of service in excess of 20 years.</p> <p>For retirement on or after September 1, 1987 and prior to September 1, 1989, 45% of average monthly salary, plus 2% of average monthly salary per year of service in excess of 20 years.</p> <p>For retirement on or after July 1, 1986 and prior to September 1, 1987, 40% of average monthly salary plus 2% of average monthly salary per year of service in excess of 20 years.</p>

Summary of Plan Provisions (continued)

Standard Service Pension (continued)

Benefit (continued)	For retirement on or after January 1, 1970 and prior to July 1, 1986, 35% of average monthly salary plus 3% of average monthly salary per year of service in excess of salary per year of service in excess of 25 years.
Maximum	<p>For retirement on or after September 1, 1991, 80% of average monthly salary.</p> <p>For retirement on or after September 1, 1989 and prior to September 1, 1991, 70% of average monthly salary.</p> <p>For retirement on or after September 1, 1987 and prior to September 1, 1989, 65% of average monthly salary.</p> <p>For retirements on or after January 1, 1970 and prior to September 1, 1987, 60% of average monthly salary.</p> <p>In addition, a member will receive a \$5,000 lump sum payment upon retirement.</p>

Alternate Service Pension

Eligibility	Firefighters who became participants prior to September 1, 1987 and who attain age 50 with 20 years of service will receive the greater of the standard or alternate pension.
Benefit	50% of average monthly salary plus 1% of average monthly salary per year of service after becoming eligible to retire on an alternate pension.
Maximum	65% of average monthly salary.

Supplemental Bonus Check

Supplemental payments totaling up to \$5 million will be payable on a prorated basis determined by the Board of Trustees to all retirees and survivors.

Summary of Plan Provisions (continued)

Deferred Retirement Option Plan (DROP)

Eligibility	20 years of service.
Benefit	Effective July 1, 2000, eligible participants may elect to participate in the DROP for up to ten years or until they leave active service. The member's standard or alternate service pension (whichever is greater) will be calculated based on service and earnings at the time the DROP is elected.

A notional account will be maintained for each DROP participant. This account will be credited with the following amounts while the member is a participant of the DROP:

- The member's monthly retirement pension, including applicable cost-of-living adjustments,
- The member's contribution to the Retirement Fund, and
- Investment earnings/losses at the rate of the Retirement Fund's earnings/losses averaged over a five-year period.

A benefit equal to the DROP account balance would be paid at the time the member leaves active service. The payment would be made as a single lump sum or as the member chooses.

Effective on July 1, 2000, a three-year back DROP is available for all eligible participants. The DROP account would be recalculated based on what the account balance would have been had the participant elected the DROP up to 3 years earlier than he/she actually did. The initial DROP entry date cannot be backdated prior to September 1, 1995, or prior to 20 years of credited service, and must be on the first of the month selected.

Summary of Plan Provisions (continued)

Deferred Retirement Option Plan (DROP) (cont.)

The monthly benefit for a participant at actual retirement will increase 2% for every year of DROP participation (Phased in at 1% effective September 1, 2000 and 1% effective September 1, 2001).

Members can remain in the DROP for 13 years. However, the member's contributions to the Fund will only be credited to his DROP account for the first ten years. Additionally, a maximum of 20% will be added to his benefit at actual retirement.

If a DROP participant suffers an on-duty disability resulting in the inability to perform any gainful activity or dies in the line of duty, the death or disability annuity benefit would be calculated as though the participant had not entered the DROP. In addition, the DROP account would be payable to the participant or beneficiary.

Service-Connected Disability Pension

Eligibility

No age or service requirements.

Benefit

50% of average monthly salary or service pension if greater and eligible. Firefighters who are not capable of performing any substantial gainful activity will receive 75% of average monthly salary, or service pension, if greater and eligible.

In addition, a member will receive a \$5,000 lump sum.

Non-Service-Connected Disability Pension

Eligibility

No age or service requirements.

Benefit

25% of average monthly salary, plus 2.5% of average monthly salary per year of service.

Maximum

50% of average monthly salary or service pension, if greater and eligible.

In addition, a member will receive a \$5,000 lump sum.

Vested Pension

Eligibility

At least 10 but less than 20 years of service.

Benefit

1.7% of average monthly salary per year of service, payable beginning at age 50 or optional refund of contributions with interest at a flat rate of 5% not compounded.

Summary of Plan Provisions (continued)

Death Benefits

Payable as specified below if survived by a spouse, dependent children, or dependent parents. Effective November 1, 1997 dependent children can continue to receive benefits between the ages of 18 and 22 if they are in college.

Non-service-connected: Monthly benefit that would have been payable had the participant retired for non-service-connected disability on the date of his or her death (or service pension if greater).

Postretirement: Monthly benefit which was payable to the participant prior to his or her death. Effective July 1, 1998, a "graded" postretirement death benefit is payable to a surviving spouse if the retiree was not married at the time of retirement. This "graded" benefit is equal to 20% of the postretirement death benefit for each year of marriage to a maximum 100% after five years of marriage.

Preretirement: Refund of contributions made if no eligible survivors. If death occurs after 10 years of service, interest is credited on the contributions at the flat rate of 5% not compounded. If death occurs before 10 years of service, no interest is credited.

Lump sum: A one-time \$5,000 lump sum death benefit for any active or retired firefighter. This benefit applies to active members, current retirees, and disabled participants.

Additional Benefit

Effective on or after July 1, 2001, an extra monthly benefit of \$150 is payable for life to any retired or disabled member or to an eligible survivor of a deceased member. This benefit is not subject to the postretirement adjustment.

Excess Benefit

Benefit equal to the excess of any members' standard service pension benefit over the limit imposed by Section 415 of the code.

Postretirement Adjustment

Prior to October 1, 1990: Pensions adjusted each year based on changes in the CPI-U, but not below original amount or above original amount increased 3% each year, not compounded.

Pension adjustments for participants who retire after March 1, 1982 begin at age 55.

Summary of Plan Provisions (continued)

Postretirement Adjustment (continued)

Pension adjustments begin immediately for participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service.

On or after October 1, 1990 and prior to November 1, 1997: Pensions adjusted each year based on changes in the CPI-U. The adjustment is based on the amount of benefits payable at the time of adjustment. The maximum annual increase shall be 3% of the benefits payable at the time of adjustment.

Pension adjustments begin immediately for participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service.

On or after November 1, 1997: Pensions adjusted each year at a fixed rate of 3%. The adjustment is based on the amount of benefits payable at the time of adjustment.

Pension adjustment for participants who retire or terminate with a vested benefit after March 1, 1982 begin at age 48. Pension adjustments begin immediately for participants who become disabled and cannot perform any substantial gainful activity (current and future) and qualify for general on-duty disability benefits. Participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service are also eligible for pension adjustments to begin immediately.

Contribution Rates

Members

9% of salary. Refund of contributions without interest in the event of termination before 10 years of service.

City

Beginning in 1983, the rate required to fund the Retirement Fund on an actuarial reserve basis. However, a minimum contribution of twice the employee contribution rate is required by statute.

Changes in Plan Provisions Since the Prior Year

Plan provisions reflected in the July 1, 2015 valuation are the same as those in the prior valuation.

Actuarial Certification

We certify that the information contained in this Actuarial Report has been prepared in accordance with generally accepted actuarial principles and practices. To the best of our knowledge, the information fairly presents the actuarial position of the Houston Firefighters' Relief & Retirement Fund as of July 1, 2015.

The Board of Trustees of the Fund can use this report for determining the Actuarial City Contribution Rate. Use of this report for any other purpose or by anyone other than the Board may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. Because of the risk of misinterpretation of actuarial results, Buck recommends requesting it to perform an advance review of any statement, document, or filing based on information contained in this report. Buck will accept no liability for any such statement, document or filing made without prior review by Buck.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. An analysis of the potential range of such future differences is beyond the scope of this valuation.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities.

In preparing the actuarial results, we have relied upon information provided by the Board of Trustees regarding plan provisions, plan participants, plan assets, contribution rates and other matters used in the actuarial valuation. Although we did not audit the data, we reviewed the data for reasonableness and consistency with the prior year's information. The results of the valuation are dependent on the accuracy of the data.

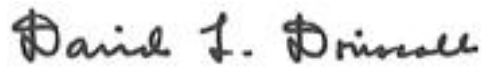
The prior actuaries prepared historical information for 2004 and prior fiscal years. We did not verify or provide an actuarial review of this historical information.

The Board of Trustees selected the actuarial methods and assumptions used in this valuation on the basis of an experience study covering the five-year period ending June 30, 2013. The Board has sole authority to determine the expected investment return and other actuarial assumptions. In our opinion, the actuarial assumptions used are appropriate for purposes of the valuation and are reasonably related to the experience of the Fund and to reasonable long-term expectations. The mortality improvement assumption was updated in accordance with Actuarial Standard of Practice No. 35.

The plan provisions are the same as those used in the previous valuation.

This report was prepared under the supervision of David Driscoll and David Kent. They are Fellows of the Society of Actuaries and Members of the American Academy of Actuaries. They meet the Academy's Qualification Standards to issue this Statement of Actuarial Opinion. This report has been prepared in accordance with all applicable Actuarial Standards of Practice and they are available to answer questions about it.

Buck Consultants, LLC



David L. Driscoll, FSA, EA, MAAA, FCA



David Kent, FSA, EA, MAAA