FUNDING FOR BRIDGE MAINTENANCE

Report prepared by CSS Bridges Group

February 2000

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1. Introduction

Bridges and retaining walls are an essential component of any highway network and Highway Authorities are under a statutory duty to maintain them. Also as they represent a significant publicly owned asset with many bridges being prominent features in the environment and some either Listed Buildings or Ancient Monuments, it would not be in the public interest to allow them to deteriorate. Unless these are maintained in a safe condition the network will become a series of unconnected links which will be of little value to the public and will definitely not deliver the current aspirations for an Integrated Transport Network. This is recognised by the Government and in their White Paper[1] on 'A New Deal for Transport ; Better for Everyone' they state that they have matched spending outlined in the Comprehensive Spending Review to their priorities and that, for transport, one is to ensure that the existing infrastructure is properly maintained and managed.

This priority is supported by the CSS Bridges Group, but they were concerned from discussions at their meetings, that the reality on the Local Authority maintained highway network appears to fall far short of the above aspirations. They, therefore, set up a Working Party in January 1999 to research the matter and to submit their Final Report to the February 2000 meeting of the CSS Bridges Group. The following report outlines what has been discovered and, whilst recognising the need for further work in some areas, it forms a good basis for discussion with the Government on funding for this important issue.

The Working Party comprised the following members of the CSS Bridges Group:-

Dr Roger Cole - Lancashire County Council (Convenor)
Mr Steve Pearson - Derbyshire County Council
Mr Greg Perks - Northumberland County Council
Mr Steve Tart - Manchester City Council
Mr Mark Wyatt - Cheshire County Council

2. Scope

The term Bridge Maintenance will include the maintenance of retaining walls as well as all bridges on the adopted highway network and therefore the report will cover the maintenance of all these highway structures. It will not include the maintenance of structures on the Trunk Road and Motorway Network or on the Public Rights of Way Network, nor those which are privately owned by such bodies as Railtrack, Rail Property Limited, British Waterways, etc. Only those bridges with spans of 1.5 metres or above will be considered as smaller structures are considered part of road maintenance because they are maintained using techniques developed by drainage engineers. It is suggested that this demarcation is used by all Local Authority Highway Authorities to assist in the compilation of comparative statistics in the future. However, all retaining walls irrespective of height will be considered provided their dominant function is to act as a retaining structure.

Whilst the report will be written with regard to the situation in England, many of its conclusions will be applicable to Scotland, Northern Ireland and Wales where the funding mechanisms are different.

Also as retaining walls generally occur mainly in the upland parts of the United Kingdom and records for these walls are not of the same standard as for bridges the report has concentrated on the funding required for the maintenance of bridges. However, it has highlighted the fact that funding is also required for the maintenance of retaining walls and that for some Highway Authorities this is a major issue.

3. Definition of Bridge Maintenance

Bridge Maintenance is defined in the OECD Report[2] as including all operations designed to maintain a bridge in a serviceable condition. This includes the following aspects:-

a) **Regular Inspections**, eg General Inspections, Principal Inspections;

b) **Routine Maintenance**, which is minor work carried out on a regular basis; eg removal of vegetation, cleaning out drainage systems, greasing of metal bearings;

c) **Steady State Maintenance**, which can be split into[3]:-

   (i) **Preventive Maintenance**, which is work to repair defects, replace components or otherwise slow down the rate of deterioration; eg repointing, repainting, rewaterproofing, minor concrete repairs, cathodic protection;

   (ii) **Essential Maintenance**, which is rehabilitation work undertaken when part (or whole) of a structure is considered to be (or about to become) structurally inadequate; eg major concrete repairs, scour repairs, masonry repairs, replacing bearings, steelwork repairs;

d) **Upgrading Work** (ie work to bring the structure up to current standards but not including strengthening), eg provision of waterproofing, upgrading parapets;

e) **Management of Substandard Bridges Prior to Strengthening**, eg monitoring;

f) **Replacement**, when a bridge reaches the end of its useable life.

Steady State Maintenance, Upgrading Work and Replacement are all defined as Structural Maintenance. Assessment and Strengthening following assessment have not been included in the above definition of Bridge Maintenance as traditionally these programmes have only been initiated nationally when significant increases have been proposed in the weight of vehicles using the roads. However, it is now becoming to be realised [3] that regular assessments

should be a feature of Bridge Maintenance in order that Bridge Maintenance Strategies can be safety related based on whole life performance techniques. This is further discussed in paragraph 9 below.

4. Census of Highway Structures

A census has been carried out of all highway structures owned by Local Authorities in England and the results of this are given in Appendix 1 with a summary below. Replacement Costs are also given and are based on information provided by Local Authorities which show that the average bridge has a replacement cost of £215,000 and the average retaining wall has a replacement cost £900,000 per km. These replacement costs do not include the cost of service diversions or traffic management as these can vary so much depending on the location of the structure. It should be noted that generally the average replacement cost of bridges is lower for Counties than for Metropolitan or Unitary Authorities because the former are more rural with narrower roads and generally have more smaller span bridges. Similar information is given for the rest of the United Kingdom where this is available from the relevant national bodies.

	Bridges		Retaining walls	
Country	**No**	**Replacement Cost (£M)**	**Length (km)**	**Replacement Cost (£M)**
England	52,060	11,193	3,038	2,734
Wales	8,239	1,648	205	185
Scotland	13,965	2,765	41	37
Northern Ireland	6,500	702	not available	

This census and the surveys of costs referred to later have shown that many Highway Authorities have inadequate records for highway structures if they are to be maintained efficiently using whole life performance techniques. There is a need for additional resources to be devoted to improving this situation. This is recognised by the Highways Agency[16] who are devoting considerable resources to improve the records of trunk road structures. Improving these records and keeping them in a consistent manner will also assist Authorities in benchmarking for Best Value. Whilst the information for bridges is likely to be fairly accurate, that for retaining walls considerably underestimate the actual values as few authorities have records.

5. Current Funding for Bridge Maintenance

a) Sources of Funding

As stated before, Government policy regarding funding is not the same in all parts of the United Kingdom. In England funding for structural maintenance of road bearing structures is provided via the Local Transport Capital Settlement whilst funding for all other aspects of bridge maintenance is provided through the Revenue Support Grant. As all of this funding is not ring fenced the actual sources of funding will vary from

authority to authority depending on local priorities, but generally Regular Inspections, Routine Maintenance and Management of Substandard Bridges are funded from revenue budgets whilst all other bridge maintenance is funded from the capital allocation for Bridge Assessment, Strengthening and Structural Maintenance.

b) **Current Level of Funding**

A survey of highway authorities shows that whilst there is some variation in the current level of funding the average values per annum are as follows:-

Bridges - £695 per bridge (equivalent to 0.32% of average Replacement Cost)

Retaining Walls - £300 per km (equivalent to 0.03% of average Replacement Cost)

6. Funding Required for Bridge Maintenance

The following methods have been considered in order to determine the level of funding which is required to keep all highway structures in a safe condition for highway users and maintained on a whole life approach aimed at a 'steady state', avoiding disproportionate costs due to traffic delay. Funding levels also being such as to allow for retaining the visual appearance of easily visible structures, particularly those of significant or historical background.

(a) **OECD Report**

This report [2] concludes that 'An annual expenditure at least equal to 0.5% of the replacement cost of the bridges seems to be necessary to implement a rational policy of preventive maintenance'. However it also states that 'In the United Kingdom maintenance expenditure of about 0.5% per annum is sufficient to cope with essential work but may not be adequate to prevent long-term deterioration'.

It should be noted that the above figures exclude the cost of regular inspections and the cost of eventual replacement. Based on a survey of inspection costs it would appear that the annual cost of inspections is approximately 0.1% of the Replacement Cost. Also assuming that bridges have a useable life of 200 years (possibly optimistic - BS5400 : Part 1[4] only gives a nominal design life of 120 years for modern structures) then the annual cost of replacing structures would be 0.5% of the Replacement Cost.

Therefore this method would recommend that the annual funding required for bridge maintenance should be:-

0.5 + 0.1 + 0.5 = 1.1% of the Replacement Cost.

The report does not cover the maintenance of retaining walls.

(b) **British Rail Commuted Sum Method**

This method[5] has been used for many years and is based on calculating the annual cost of inspecting, maintaining and eventually replacing the highway structure when it reaches the end of its useable life. It gives the cost of this as a percentage of the replacement cost for different forms of construction for both substructures and superstructures. These percentages vary from 0.375% to 1.5% for individual components and from 0.41% to 1.39% for complete bridges. The former represents a short span masonry arch bridge whilst the latter represents a multi span steel bridge on reinforced concrete supports. However, as these will only represent a small proportion of the total bridge stock it is likely that the range for individual highway authorities will be from say 0.7 to 1.1% with a national average of say 0.9% of the Replacement Cost based on the typical mix of bridge types in Local Authority ownership.

For retaining walls this method would give a range from 0.48% to 0.61% with a national average of say 0.55% of the Replacement Cost.

(c) **Lincolnshire Method**

This method is given in the document on the 'Strengthening of Railtrack owned Highway Bridges'[6]. It gives a table of costs for all maintenance operations based on the experience of one highway authority. Using this document and including the eventual replacement of the bridge when it reaches the end of its useable life gives the following percentages of the replacement cost for an average size bridge (see paragraph 4):-

Steel composite deck	-	1.19%
Reinforced concrete deck	-	0.90%
Masonry arch	-	0.76%

This would give a national average of 0.87% of the Replacement Cost based on the typical mix of bridge types in Local Authority ownership.

For retaining walls this method would give a range from 1.26 to 1.39% with a national average of say 1.3% of the Replacement Cost.

The three methods give figures which are remarkably close so it is suggested that the required annual level of funding required for maintenance should be 1.0% of the Replacement Cost for Bridges and 0.9% of the Replacement Cost for Retaining Walls.

7. Current Backlog of Bridge Maintenance

A survey of highway authorities has confirmed the fears of the Bridges Group that the level of funding provided in recent years for Bridge Maintenance has fallen short of that which is required (see 6 above). Therefore, the condition of

structures has deteriorated and it is desirable in the short term to provide additional funding to overcome the backlog if even greater funding in the future is to be avoided.

The survey reveals that, whilst the backlog varies from authority to authority, on average it amounts to £6,875 per bridge (equivalent to 3.2% of the average Replacement Cost). Therefore if this backlog is to be overcome in a 10 year programme then the required funding for bridge maintenance would need to increase by 0.3% of the Replacement Cost above that normally required for the next 10 years (ie Required Funding = 1.3% of Replacement Cost).

Whilst considerable funding has been made available since 1991 in England for the Assessment and Strengthening Programme, this has not resulted in more bridges being replaced than should be done based on a useable life of 200 years (see paragraph 6(a) above). This conclusion is based on the experience of typical authorities and from an examination of the amount of funding made available nationally for the Strengthening Programme. So whilst this has helped in replacing the weakest structures in the past few years, it has not offset the problem of inadequate funding for Bridge Maintenance and also this programme was always considered by the Government to be of limited duration.

Records of the backlog of maintenance work on retaining walls are not generally available, but driving through the upland parts of the United Kingdom one is soon aware of the large backlog of maintenance work on many masonry retaining walls which are necessary to support the roads on sidelong ground. This is confirmed by the highway authorities in this area who only have sufficient funding to rebuild those collapsed walls, which cause the most disruption to highway users, and are therefore not able to fund a programme of inspection and preventive maintenance.

8. Indicator for Measuring Condition of Highway Structures

It will be essential to have a numerical indicator which can be used to determine whether the overall condition of highway structures is deteriorating or not in order to assess whether sufficient is being spent on Bridge Maintenance.

Some County Councils have developed a simple Bridge Condition Index based on work originally done by Berkshire County Council which uses the information provided from General Inspections. This uses a numerical indicator to express the condition of each component in a bridge and then calculates a weighted average for the whole bridge depending on the relative importance of each component to the integrity of the bridge. These values for individual bridges are then averaged (sometimes weighted according to the importance of the bridge in the network) to give Condition Index for the whole bridge stock.

The Highways Agency is developing a more complex Bridge Condition Index [7] which will use the information provided by the revised General Inspections [8] which will be introduced shortly. In these inspections the condition of individual segments making up a component is recorded and a complex algorithm is used to calculate the Bridge Condition Index.

CSS Bridges Group have had discussions with TRL about a possible research project which would develop the above ideas further and provide a nationally recognised Bridge Condition Index for Local Authority owned structures. The CSS Research Fund have agreed to finance this project and it is hoped that other Bridge Owners may be involved in order that the project may benefit from their expertise and also ensure that the indicator has wider usage than purely for Local Authority owned structures. This indicator could also be used to develop a Performance Indicator for Bridge Maintenance in the Best Value initiative taking note of alternative suggestions being pursued by the Highways Agency[9].

The research project would also investigate how this indicator could be used in conjunction with deterioration models currently being developed by various bodies [10], [11], [12] to enable cost effective maintenance strategies based on whole life costing to be implemented.

9. Bridge Assessments

As the result of a Bridge Assessment remains valid only so long as the condition of the structure including the carriageway surfacing does not deteriorate or its use does not vary from that assumed in the assessment, there is a need to have an ongoing programme of assessments following on from the completion of the recent BD21 Assessment Programme.

British Waterways[13] re-evaluate the Condition Factor used in their assessments when the 6 yearly Principal Inspections are carried out and review the assessment accordingly. Railtrack[14] review their assessments whenever there is a significant change in condition of the bridge and have recently decided to review all assessments every 18 years.

The Highways Agency [15] have proposals to introduce a new steady state assessment programme. This will generally cover those bridges not in the BD21 Assessment Programme, revisit bridges that previously just passed their assessment and address any concerns, which may arise from research funding and experience.

In view of this it would be advisable if Local Authorities also had an ongoing programme of assessments. It is suggested that this will involve either reviewing assessments or completely re-assessing/assessing bridges if the use of the structure changed (eg lane marking altered, increased traffic flows due to development in the area) or at a frequency of between six to eighteen years. The assessment frequency will depend on whether there has been significant deterioration since the last assessment and the margin by which the bridge passed its previous assessment. It is estimated that this would require additional funding equivalent to 0.07% of the Replacement Cost of the Bridge Stock.

10. Conclusions

The main conclusions of this report are that:-

- there is a significant backlog of Bridge Maintenance in England;
- the current levels of expenditure on Bridge Maintenance are inadequate;
- the condition of both bridges and retaining walls will continue to deteriorate unless significant additional funding is provided in the future.

This will eventually lead to the need to weight restrict many bridges with the consequent increase in traffic congestion and effect on the economy. It will also then be necessary to inject considerably more funding to redress the situation than if it had been provided now.

There is also the significant risk that highway structures could become unsafe with possible catastrophic failures and loss of life. This danger has been highlighted in the recent report of the Standing Committee on Structural Safety [17] who said:-

> 'Although the number of structures that become unsafe has been quite small in recent times, the potential for safety loss to become widespread is substantial. The fact that the number is small is due largely to the skill and dedication of professional civil and structural engineers in averting recurrences. There is a strong tendency amongst those in Government and others who are responsible for structural maintenance and procurement resources to make the comfortable assumption that all is well and will continue to be well even if resource is reduced. The good record of structural safety may not be sustained in the future without adequate resources to maintain safety standards.'

The following detailed conclusions arise from the study carried out by the Working Party:-

(a) There are 52,060 bridges and at least 3,038 km of retaining walls owned by Highway Authorities in England with a Replacement Cost of £11,193M and at least £2,734M respectively.

(b) Currently an average of £695 per bridge (equivalent to 0.32% of average Replacement Cost) and £300 per km of retaining wall (equivalent to 0.03% of average Replacement Cost) is being spent annually on their maintenance.

(c) An annual level of funding equivalent to 1.0% of the Replacement Cost for Bridges and 0.9% of the Replacement Cost for Retaining Walls is required in order to prevent their long term deterioration.

(d) The total shortfall in maintenance expenditure on Bridges and Retaining Walls in England is currently at least £100M per year.

(e) Currently there is a backlog of Bridge Maintenance in England of £6,875 per bridge (equivalent to 3.2% of the average Replacement Cost) or £357M in total. Additional funding equivalent to 0.3% of the Replacement Costs is required over a 10 year period to remove this

backlog. Figures are not available for the backlog of Retaining Wall Maintenance but it would appear to be at least of the order of £250M.

(f) Additional annual funding equivalent to 0.07% of the Replacement Cost of the Bridge Stock in England (ie £7M) should be provided to implement an ongoing programme of Bridge Assessments.

(g) Funding should be provided from the CSS Research Fund to enable TRL to carry out a research project into developing a Bridge Condition Index for Local Authority owned bridges.

(h) Additional resources should be devoted to improving the records that Highway Authorities have for highway structures so that they can be managed more efficiently.

(i) Records should be kept in a consistent manner to assist benchmarking for Best Value and to enable national statistics to be maintained.

11. References

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APPENDIX 1 - BRIDGE CENSUS

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	Masonry/Brick Structures Numbers		Concrete Deck Structures Numbers		Metal Deck & Corrugated Structures Numbers		Timber Structures Numbers		Nett Area of Structures 1 - 4 m2	Gantries	Total Number of Structures 1 to 4 + 6	RW's 1.5m or more retained ht O/A Length (metres)	Other RW's O/A Length (metres)
	Bridge	FB	Bridge	FB	Bridge	FB	Bridge	FB					
ABERDEEN City	116	0	58	2	30	4	1	0	92901	0	211	0	0
ABERDEENSHIRE	1044	0	429	0	173	0	0	0	130000	0	1646	0	0
ANGUS	191	0	39	0	61	0	0	0	Unknown	0	291	Unknown	Unknown
ARGYLL and BUTE	394	0	381	0	37	1	1	0	Unknown	0	814	Unknown	Unknown
CITY OF EDINBURGH	260	0	97	3	45	8	0	2	Unknown	0	415	Unknown	Unknown
CLACKMANNANSHIRE	19	0	23	0	0	1	0	2	5000	0	45	500	Unknown
DUMFRIES & GALLOWAY	690	2	169	0	101	5	1	2	3500	0	970	Unknown	Unknown
DUNDEE City	15	0	22	2	15	6	0	0	Unknown	1	61	Unknown	Unknown
EAST AYRSHIRE	202	3	48	7	30	23	0	2	Unknown	0	315	396	0
EAST DUNBARTONSHIRE	48	1	52	0	23	1	0	0	9940	0	125	Unknown	Unknown
EAST LOTHIAN	138	0	48	2	5	2	0	12	Unknown	0	207	Unknown	Unknown
EAST RENFREWSHIRE	64	0	26	0	12	5	0	0	4980	1	108	103	Unknown
GLASGOW City	41	3	106	12	57	17	0	0	Unknown	29	265	Unknown	Unknown
HIGHLAND	455	0	745	5	300	10	20	5	60800	2	1542	Unknown	Unknown
INVERCLYDE	96	10	46	0	36	12	0	0	11279	0	200	Unknown	Unknown
MIDLOTHIAN	84	0	42	1	15	0	0	0	9800	0	142	4980	22950
MORAY	233	0	168	2	63	0	5	0	26000	0	471	Unknown	Unknown
NORTH AYRSHIRE	132	0	92	6	52	1	0	2	22460	0	285	Unknown	Unknown
NORTH LANARKSHIRE	121	5	144	39	95	18	0	3	Unknown	0	425	Unknown	Unknown
ORKNEY	31	0	4	0	3	0	0	0	1400	0	38	6000	6000
PERTH & KINROSS	339	0	105	0	53	3	0	0	20080	0	500	Unknown	Unknown
RENFREWSHIRE	98	0	62	6	23	4	0	0	22223	0	193	Unknown	Unknown
SCOTTISH BORDERS	773	5	83	4	145	41	4	13	88553	0	1068	Unknown	Unknown
SHETLAND ISLANDS	3	0	9	1	1	0	0	0	Unknown	0	14	Unknown	Unknown
SOUTH LANARKSHIRE	650	0	382	8	255	5	1	3	Unknown	7	1311	Unknown	Unknown
WEST DUNBARTONSHIRE	38	0	74	9	42	12	0	5	2861	15	195	Unknown	Unknown
WEST LOTHIAN	216	0	257	23	35	1	0	10	Unknown	0	542	Unknown	Unknown
WESTERN ISLES	6	0	96	0	37	2	7	0	5708	0	148	Unknown	Unknown
SOUTH AYRSHIRE	164	2	44	1	36	10	0	2	Unknown	0	259	Unknown	Unknown
TOTALS	6661	31	3851	133	1780	192	40	63	517485	55	12806	11979	28950

12751

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures Numbers**		**Concrete Deck Structures Numbers**		**Metal Deck & Corrugated Structures Numbers**		**Timber Structures Numbers**		**Nett Area of Structures 1 - 4 m2**	**Gantries**	**Total Number of Structures 1 to 4 + 6**	**RW's 1.5m or more retained ht O/A Length (metres)**	**Other RW's O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
ANGLESEY C.C.	69	Unknown	39	Unknown	6	2	0	Unknown	Unknown	0	116	10768	0
BLAENAU GWENT CBC	27	3	25	6	22	25	Unknown	8	Unknown	Unknown	116		
BRIDGEND	37	3	58	33	4	10	2	6	11000	0	153	Unknown	Unknown
CAERPHILLY CBC	59	11	98	24	35	46	2	7	Unknown	Unknown	282		
CARDIFF	32	0	160	0	32	3	0	0	Unknown	7	234	1000	Unknown
CARMARTHENSHIRE CC	595	0	685	0	120	0	0	0	Unknown	Unknown	1400	Unknown	Unknown
CEREDIGION CC	221	2	153	3	28	1	0	4	16906	0	412	970	0
CONWY CBC	164	0	100	9	6	0	1	7	19448	0	287	Unknown	Unknown
DENBIGHSHIRE CC	123	0	74	0	29	5	0	0	22520	0	231	14000	14000
FLINTSHIRE CC	73	0	73	0	18	2	0	0	41724	0	166	2900	150
GWYNEDD C.C.	454	2	228	4	54	5	0	3	31220	0	750	75000	56000
MERTHYR TYDFIL CBC	20	0	20	1	7	8	0	1	9195	0	57	4000	Unknown
MONMOUTHSHIRE CC	184	16	71	34	50	24	4	97	Unknown	Unknown	480		
NEATH PORT TALBOT CBC	75	9	156	14	68	25	0	7	52250	0	354	24500	Unknown
NEWPORT CBC	39	35	80	60	59	26	5	71	Unknown	Unknown	375		
PEMBROKESHIRE CC	198	1	206	3	20	0	0	6	25294	0	434	Uknown	Unknown
POWYS CC	393	Unknown	405	Unknown	230	Unknown	6	Unknown	58422	0	1034	Unknown	Unknown
RHONDDA CYNON TAFF CBC	118	4	185	50	63	24	0	7	Unknown	Unknown	451	Unknown	Unknown
SWANSEA	58	3	110	11	23	26	1	0	30433	0	232	Unknown	Unknown
TORFAEN CBC	51	7	59	32	30	25	0	31	Unknown	Unknown	235		
VALE of GLAMORGAN	108	0	112	0	39	2	0	0	Unknown	0	261	1157	654
WREXHAM COUNTY BOROUGH	109	0	53	0	22	2	0	0	13054	0	186	Unknown	Unknown
TOTALS	3207	96	3150	284	965	261	21	255	331466	7	8246	134295	70804

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures Numbers**		**Concrete Deck Structures Numbers**		**Metal Deck & Corrugated Structures Numbers**		**Timber Structures Numbers**		**Nett Area of Structures 1 - 4 m2**	**Gantries**	**Total Number of Structures 1 to 4 + 6**	**RW's 1.5m or more retained ht O/A Length (metres)**	**Other RW's O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
BATH & NE SOMERSET	103	3	46	9	6	0	0	2	9200	0	169	7500	10000
BOURNEMOUTH	18	0	15	1	4	1	0	1	Unknown	Unknown	40	Unknown	Unknown
BRISTOL CITY	84	6	137	23	76	42	0	2	24140	9	379	400	Unknown
CORNWALL CC	842	9	223	7	29	5	10	6	32638	0	1131	62000	62000
DEVON CC	1823	3	658	6	103	15	0	45	Unknown	0	2653	Unknown	Unknown
DORSET CC	479	4	257	5	1	3	0	16	Unknown	0	765	4933	Unknown
GLOUCESTERSHIRE CC	386	41	283	18	71	5	1	10	39960	0	815	Unknown	Unknown
NORTH SOMERSET CC	206	0	160	6	91	6	0	0	Unknown	2	471	3500	3000
PLYMOUTH	39	0	102	11	7	19	0	1	24414	0	179	10000	10000
POOLE BORO	6	1	52	5	0	1	0	0	15209	6	71	600	565
SOMERSET CC	787	0	373	2	68	4	1	5	36136	0	1240	10000	Unknown
SOUTH GLOUCESTERSHIRE	68	1	57	4	15	3	0	2	Unknown	Unknown	150	Unknown	Unknown
SWINDON	41	1	34	2	9	2	0	1	Unknown	Unknown	90	Unknown	Unknown
TORBAY	18	0	15	1	4	1	0	1	Unknown	Unknown	40	Unknown	Unknown
WILTSHIRE CC	502	11	242	43	86	40	0	72	31910	0	996	Unknown	Unknown
TOTALS	5402	80	2654	143	570	147	12	164	213607	17	9189	98933	85565

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures**		**Concrete Deck Structures**		**Metal Deck & Corrugated Structures**		**Timber Structures**		**Nett Area of Structures 1 - 4**	**Gantries**	**Total Number of Structures**	**RW's 1.5m or more retained ht**	**Other RW's**
	Numbers		**Numbers**		**Numbers**		**Numbers**		**m2**		**1 to 4 + 6**	**O/A Length (metres)**	**O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
6 BERKS UNITARIES	396	Unknown	244	Unknown	78	Unknown	18	Unknown	23025	11	747	4608	0
BRACKNELL - SEE 6													
BRIGHTON & HOVE	33	1	29	0	0	2	0	0	20000	0	65	4527	171
BUCKINGHAMSHIRE CC	94	5	179	3	46	8	0	0	29373	0	335	Unknown	Unknown
EAST SUSSEX CC	184	2	136	12	32	21	0	3	40602	0	390	7959	2894
HAMPSHIRE CC	456	13	776	29	81	52	1	56	120152	3	1467	2000	2000
ISLE OF WIGHT	59	1	49	3	13	3	0	2	Unknown	Unknown	130	Unknown	Unknown
KENT CC	527	6	907	110	184	30	0	13	47645	10	1787	22500	22500
MEDWAY	41	1	34	2	9	2	0	1	Unknown	Unknown	90	Unknown	Unknown
MILTON KEYNES	30	0	516	55	12	2	0	10	132000	0	625	Unknown	Unknown
OXFORDSHIRE CC	302	10	321	18	37	20	0	30	50031	0	738	Unknown	Unknown
PORTSMOUTH City	0	1	36	17	2	6	0	1	11064	0	63	0	0
READING - SEE 6													
SLOUGH - SEE 6													
SOUTHAMPTON City	4	0	175	17	1	1	0	5	28266	0	203	16	Unknown
SURREY CC	373	0	315	32	114	33	0	2	Unknown	0	869	800	Unknown
WEST BERKSHIRE - SEE 6													
WEST SUSSEX CC	300	4	288	9	50	29	0	7	Unknown	0	687	31	Unknown
WINDSOR & MHEAD - SEE 6													
WOKINGHAM - SEE 6													
TOTALS	2799	44	4005	307	659	209	19	130	502158	24	8196	42441	27565

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures Numbers**		**Concrete Deck Structures Numbers**		**Metal Deck & Corrugated Structures Numbers**		**Timber Structures Numbers**		**Nett Area of Structures 1 - 4 m2**	**Gantries**	**Total Number of Structures 1 to 4 + 6**	**RW's 1.5m or more retained ht O/A Length (metres)**	**Other RW's O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
BARKING & DAGENHAM	2		16		4		0		Unknown	Unknown	22	145	145
BARNET	52		34		4		0		Unknown	Unknown	90	Unknown	Unknown
BEXLEY	7		41		12		0		Unknown	Unknown	60	Unknown	Unknown
BRENT	12		43		28		0		Unknown	Unknown	83	50	50
BROMLEY	17		78		3		0		Unknown	Unknown	98	145	145
CAMDEN	26		16		2		0		Unknown	Unknown	44	Unknown	Unknown
CROYDON	1		40		19		0		Unknown	Unknown	60	1000	1000
EALING	2		35		3		0		Unknown	Unknown	40	120	120
ENFIELD	95	0	102	25	20	0	0	0	Unknown	2	244	500	500
FULHAM - see Hammersmith													
GREENWICH	7		42		19		0		Unknown	Unknown	68	2000	2000
HACKNEY	1		13		6		0		Unknown	Unknown	20	Unknown	Unknown
HAMMERSMITH - inc Fulham	3		8		9		0		Unknown	Unknown	20	Unknown	Unknown
HARINGEY	5	0	20	1	2	3	0	0	2480	Unknown	31	Unknown	Unknown
HARROW	4		62		9		0		Unknown	Unknown	75	185	185
HAVERING	20		56		4		0		Unknown	Unknown	80	20	20
HILLINGDON	34		82		23		0		Unknown	Unknown	139	2450	2450
HOUNSLOW	34		21		0		0		Unknown	Unknown	55	2625	2625
ISLINGTON	5		2		9		0		Unknown	Unknown	16	Unknown	Unknown
KENSINGTON & CHELSEA	0		3		1		0		Unknown	Unknown	4	1250	1250
KINGSTON ON THAMES	6		28		7		0		Unknown	Unknown	41	Unknown	Unknown
LAMBETH	1		8		18		0		Unknown	Unknown	27	435	435
LEWISHAM	3		18		38		0		Unknown	Unknown	59	225	225
LONDON CITY	50		24		20		0		Unknown	Unknown	94	510	510
MERTON	12		32		3		0		Unknown	Unknown	47	215	215
NEWHAM	31	1	26	2	7	2	0	1	Unknown	Unknown	70	Unknown	Unknown
REDBRIDGE	3	0	23	0	1	1	0	0	12197	0	28	650	0
RICHMOND ON THAMES	23		17		9		0		Unknown	Unknown	49	365	365
SOUTHWARK	18		74		19		0		Unknown	Unknown	111	1720	1720
SUTTON	16	0	35	7	20	7	0	0	11223	0	85	2450	4650
TOWER HAMLETS	5		24		8		0		Unknown	Unknown	37	Unknown	Unknown
WALTHAM FOREST	10		45		27		0		Unknown	Unknown	82	100	100
WANDSWORTH	45		22		15		0		Unknown	Unknown	82	Unknown	Unknown
WESTMINSTER	35		140		59		0		Unknown	Unknown	234	2175	2175
TOTALS	585	1	1230	35	428	13	0	1	25900	2	2295	19335	20885

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures Numbers**		**Concrete Deck Structures Numbers**		**Metal Deck & Corrugated Structures Numbers**		**Timber Structures Numbers**		**Nett Area of Structures 1 - 4 m2**	**Gantries**	**Total Number of Structures 1 to 4 + 6**	**RW's 1.5m or more retained ht O/A Length (metres)**	**Other RW's O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
BEDFORDSHIRE CC	234	Unknown	362	Unknown	18	Unknown	0	Unknown	84600	Unknown	614	Unknown	Unknown
CAMBRIDGESHIRE	550	5	800	15	150	5	0	25	131430	0	1550	Unknown	Unknown
ESSEX CC	248	1	419	47	160	74	2	13	87614	4	968	4792	Unknown
HERTFORDSHIRE CC	91	0	559	33	7	33	0	9	82400	3	735	2000	500
LUTON	18	0	15	1	4	1	0	1	Unknown	Unknown	40	Unknown	Unknown
NORFOLK	294	2	336	14	103	30	0	14	53000	0	793	370	0
PETERBOROUGH	54	1	45	3	12	3	0	2	Unknown	Unknown	120	Unknown	Unknown
SOUTHEND	18	0	15	1	4	1	0	1	Unknown	Unknown	40	Unknown	Unknown
SUFFOLK CC	281	1	569	5	99	29	2	6	44300	0	992	3673	6512
THURROCK	31	1	26	2	7	2	0	1	Unknown	Unknown	70	Unknown	Unknown
TOTALS	1819	11	3146	121	564	178	4	72	483344	7	5922	10835	7012

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	Masonry/Brick Structures Numbers		Concrete Deck Structures Numbers		Metal Deck & Corrugated Structures Numbers		Timber Structures Numbers		Nett Area of Structures 1 - 4 m2	Gantries	Total Number of Structures 1 to 4 + 6	RW's 1.5m or more retained ht O/A Length (metres)	Other RW's O/A Length (metres)
	Bridge	FB	Bridge	FB	Bridge	FB	Bridge	FB					
BIRMINGHAM CITY	121	11	291	45	123	22	0	12	150900	28	653	16500	6500
COVENTRY CITY	25	2	138	15	24	11	0	0	Unknown	18	233	Unknown	Unknown
DUDLEY MBC	10	2	52	1	9	5	1	0	7733	5	85	1200	Unknown
HEREFORDSHIRE	461	3	163	0	30	4	0	0	26750	0	661	Unknown	Unknown
SANDWELL MBC	22	0	106	0	33	0	0	0	31341	0	161	Unknown	Unknown
SHROPSHIRE CC	527	Unknown	218	Unknown	87	Unknown	5	Unknown	38000	0	837	Unknown	Unknown
SOLIHULL MBC	44	10	196	29	10	2	0	59	19950	1	351	50	50
STAFFORDSHIRE CC	496	1	461	27	66	12	20	10	84440	0	1093	27500	Unknown
STOKE ON TRENT	17	0	77	3	10	2	0	0	15000	0	109	5000	Unknown
TELFORD & WREKIN	45	1	37	3	10	2	0	2	Unknown	Unknown	100	Unknown	Unknown
WALSALL MBC	16	Unknown	26	Unknown	45	Unknown	0	Unknown	Unknown	Unknown	87	Unknown	Unknown
WARWICKSHIRE CC	376	10	234	12	29	11	0	5	38650	0	677	Unknown	Unknown
WOLVERHAMPTON MBC	4	2	67	15	23	3	0	2	Unknown	0	116	3000	Unknown
WORCESTERSHIRE	286	0	443	8	32	3	0	7	78750	4	783	2000	0
TOTALS	2450	42	2509	158	531	77	26	97	491514	56	5946	55250	6550

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures** Numbers		**Concrete Deck Structures** Numbers		**Metal Deck & Corrugated Structures** Numbers		**Timber Structures** Numbers		**Nett Area of Structures 1 - 4** m2	**Gantries**	**Total Number of Structures** 1 to 4 + 6	**RW's 1.5m or more retained ht** O/A Length (metres)	**Other RW's** O/A Length (metres)
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
DERBY CITY	12	0	54	11	10	7	0	4	Unknown	8	106	Unknown	Unknown
DERBYSHIRE CC	630	1	480	16	82	11	0	9	Unknown	2	1231	300000	500000
LEICESTER	11	5	97	27	24	13	0	3	40430	21	201	0	2870
LEICESTERSHIRE	261	1	241	11	43	6	0	3	48960	Unknown	566	Unknown	Unknown
LINCOLNSHIRE CC	427	10	636	83	259	28	0	71	83636	10	1524	2403	1303
NORTHANTS CC	360	2	371	18	41	2	0	2	Unknown	16	812	2200	Unknown
NOTTINGHAM CITY	31	2	72	1	24	7	0	0	25588	0	137	Unknown	Unknown
NOTTINGHAMSHIRE CC	598	12	299	5	99	10	0	0	Unknown	3	1026	Unknown	Unknown
RUTLAND	43	0	18	0	5	0	0	2	3264	Unknown	68	Unknown	Unknown
TOTALS	2373	33	2268	172	587	84	0	94	201878	60	5671	304603	504173

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	Masonry/Brick Structures Numbers		Concrete Deck Structures Numbers		Metal Deck & Corrugated Structures Numbers		Timber Structures Numbers		Nett Area of Structures 1 - 4 m2	Gantries	Total Number of Structures 1 to 4 + 6	RW's 1.5m or more retained ht O/A Length (metres)	Other RW's O/A Length (metres)
	Bridge	FB	Bridge	FB	Bridge	FB	Bridge	FB					
BARNSLEY	86	0	30	2	73	2	0	0	13000	0	193	27000	15000
BRADFORD	148	66	75	29	22	34	0	41	25600	22	437	28000	28000
CALDERDALE	181	50	42	15	33	30	0	27	36500	4	382	Unknown	Unknown
DONCASTER	159	24	115	21	134	6	0	0	64500	0	459	6850	0
EAST RIDING YORKS	248	1	128	4	40	8	1	1	22162	0	431	Unknown	Unknown
KINGSTON ON HULL CITY	46	5	70	10	13	2	0	3	16155	5	154	3500	Unknown
KIRKLEES	185	60	50	55	40	65	0	50	Unknown	3	508	400000	0
LEEDS	108	2	82	11	23	15	0	0	47456	42	283	6170	Unknown
N E LINCOLNSHIRE	15	0	46	0	10	0	0	0	Unknown	2	73	800	50
NORTH LINCOLNSHIRE	50	0	48	0	21	5	0	0	10038	0	124	100	0
NORTH YORKSHIRE	1034	30	134	30	87	30	0	40	74650	0	1385	250000	200000
ROTHERHAM	28	0	75	3	39	6	0	1	Unknown	0	152	Unknown	Unknown
SHEFFIELD CITY	152	28	154	54	22	33	0	25	Unknown	17	485	Unknown	Unknown
WAKEFIELD	44	0	62	4	16	12	0	0	21887	8	146	3200	Unknown
YORK CITY	23	0	43	1	6	0	0	0	Unknown	0	73	Unknown	Unknown
TOTALS	2507	266	1154	239	579	248	1	188	331948	103	5285	725620	243050

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	Masonry/Brick Structures Numbers		Concrete Deck Structures Numbers		Metal Deck & Corrugated Structures Numbers		Timber Structures Numbers		Nett Area of Structures 1 - 4 m2	Gantries	Total Number of Structures 1 to 4 + 6	RW's 1.5m or more retained ht O/A Length (metres)	Other RW's O/A Length (metres)
	Bridge	FB	Bridge	FB	Bridge	FB	Bridge	FB					
BLACKBURN WITH DARWEN	31	1	26	2	7	2	0	1	Unknown	Unknown	70	Unknown	Unknown
BLACKPOOL	3	0	11	0	6	0	0	0	Unknown	Unknown	20	Unknown	Unknown
BOLTON MBC	72	2	51	7	10	18	0	3	18296	2	165	2496	0
BURY MBC	84	5	36	7	32	20	2	10	50310	Unknown	196	8000	12000
CHESHIRE CC	435	1	117	11	45	11	1	4	49180	0	625	2500	Unknown
CUMBRIA	1081	2	415	7	83	19	0	9	74395	0	1616	100000	100000
HALTON BC	15	1	78	16	29	7	2	3	13010	6	157	Unknown	Unknown
KNOWSLEY MBC	31	1	26	2	7	2	0	1	Unknown	Unknown	70	Unknown	Unknown
LANCASHIRE CC	708	1	499	24	139	38	0	2	Unknown	7	1418	196000	196000
LIVERPOOL MBC	18		61		39		0		Unknown	Unknown	118	1400	1400
MANCHESTER MBC	131	5	78	8	46	12	0	3	Unknown	16	299	2500	3703
OLDHAM MBC	55		49		35		0		Unknown	Unknown	139	15500	15500
ROCHDALE MBC	198	Unknown	109	Unknown	85	Unknown	Unknown	Unknown	Unknown	0	392	4000	4000
SALFORD MBC	14	2	57	8	15	13	0	1	23473	4	114	3791	0
SEFTON MBC	35	0	70	3	58	20	0	4	31150	4	194	Unknown	Unknown
ST HELENS MBC	53		56		21		0		Unknown	Unknown	130	500	500
STOCKPORT MBC	77		44		12		0		Unknown	Unknown	133	3050	3050
TAMESIDE MBC	39	0	38	0	21	4	0	0	11150	0	102	9000	10000
TRAFFORD MBC	35		31		13		0		Unknown	Unknown	79	500	500
WARRINGTON MBC	31	1	26	2	7	2	0	1	Unknown	Unknown	70	Unknown	Unknown
WIGAN MBC	53	0	46	0	16	1	0	0	10247	0	116	2000	1000
WIRRAL MBC	23		29		41		0		Unknown	Unknown	93	300	300
TOTALS	3222	22	1953	97	767	169	5	42	281211	39	6316	351537	347953

BRIDGE CENSUS - 2000

	1		2		3		4		5	6	7	8	9
AUTHORITY	**Masonry/Brick Structures Numbers**		**Concrete Deck Structures Numbers**		**Metal Deck & Corrugated Structures Numbers**		**Timber Structures Numbers**		**Nett Area of Structures 1 - 4 m2**	**Gantries**	**Total Number of Structures 1 to 4 + 6**	**RW's 1.5m or more retained ht O/A Length (metres)**	**Other RW's O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**					
DARLINGTON	29	0	36	0	12	0	0	0	8229	0	77	Unknown	Unknown
DURHAM CC	282	0	187	2	79	6	0	0	45176	0	556	50000	75000
GATESHEAD	17	0	74	9	16	12	0	1	Unknown	5	134	Unknown	Unknown
HARTLEPOOL	7	0	19	0	6	0	0	0	4569	4	36	50	20
MIDDLESBROUGH	18	0	15	1	4	1	0	1	Unknown	Unknown	40	Unknown	Unknown
NEWCASTLE CITY	13	0	58	0	18	0	13	0	65934	Unknown	102	Unknown	Unknown
NORTH TYNESIDE	5	3	63	9	2	1	0	0	23312	Unknown	83	Unknown	Unknown
NORTHUMBERLAND	615	9	1249	95	39	12	0	75	Unknown	0	2094	27172	27173
REDCAR & CLEVELAND	32	1	80	5	17	0	0	0	Unknown	0	135	4000	1450
SOUTH TYNESIDE MBC	9	0	28	5	9	1	0	0	9199	0	52	Unknown	Unknown
STOCKTON	41	1	34	2	9	2	0	1	Unknown	Unknown	90	Unknown	Unknown
SUNDERLAND	14		125		19		0		Unknown	Unknown	158	1250	1250
TOTALS	1082	14	1968	128	230	35	13	78	156419	9	3557	82472	104893

	1		2		3		4		5		6	7	8	9
AUTHORITY	**Masonry/Brick Structures**		**Concrete Deck Structures**		**Metal Deck & Corrugated Structures**		**Timber Structures**		**Nett Area of Structures 1 - 4**	**Total**	**Gantries**	**Total Number of Structures**	**RW's 1.5m or more retained ht**	**Other RW's**
	Numbers		**Numbers**		**Numbers**		**Numbers**		**sq metres**	**Bridges**	**Numbers**	**1 - 4 plus 6**	**O/A Length (metres)**	**O/A Length (metres)**
	Bridge	**FB**	**Bridge**	**FB**	**Bridge**	**FB**	**Bridge**	**FB**						
SCOTLAND	6661	31	3851	133	1780	192	40	63	517485	12751	55	12806	11979	28950
WALES	3207	96	3150	284	965	261	21	255	331466	8239	7	8246	134295	70804
SOUTH WEST	5402	80	2654	143	570	147	12	164	213607	9172	17	9189	98933	85565
SOUTH EAST	2799	44	4005	307	659	209	19	130	502158	8172	24	8196	42441	27565
LOBEG	585	1	1230	35	428	13	0	1	25900	2293	2	2295	19335	20885
EASTERN	1819	11	3146	121	564	178	4	72	483344	5915	7	5922	10835	7012
WEST MIDLANDS	2450	42	2509	158	531	77	26	97	491514	5890	56	5946	55250	6550
EAST MIDLANDS	2373	33	2268	172	587	84	0	94	201878	5611	60	5671	304603	504173
YORKS & HUMBER	2507	266	1154	239	579	248	1	188	331948	5182	103	5285	725620	243050
NORTH WEST	3222	22	1953	97	767	169	5	42	281211	6277	39	6316	351537	347953
NORTHERN	1082	14	1968	128	230	35	13	78	156419	3548	9	3557	82472	104893
ENGLAND TOTALS	22239	513	20887	1400	4915	1160	80	866	2687979	52060	317	52377	1691026	1347646
EWS TOTALS	32107	640	27888	1817	7660	1613	141	1184	3536930	73050	379	73429	1837300	1447400

Note :
Above figures are 'straight totals' - ie totals for all columns assuming 'unknown' entries are zeros.

	1		2		3		4		5	6	7	8	9
AUTHORITY	Masonry/Brick Structures Numbers		Concrete Deck Structures Numbers		Metal Deck & Corrugated Structures Numbers		Timber Structures Numbers		Nett Area of Structures 1 - 4 sq metres	Gantries Numbers	Total Number of Structures 1 - 4 plus 6	RW's 1.5m or more retained ht O/A Length (metres)	Other RW's O/A Length (metres)
	Bridge	FB	Bridge	FB	Bridge	FB	Bridge	FB					

Notes.

Ref: Columns 1 - 9

1. Bridges to include all structures other than footbridges & gantries with a span of 1.5 metres or more.
2. Multiple span bridges with no embankment discontinuity to be counted as one structure.
3. Widened bridges, even if widening of distinct & different construction, to be counted as one structure.
4. FB's to include all structures essentially part of the highway ie: over or parallell with the highway. Cross country footpath bridges are excluded.

Ref: Column 5.

5. "Nett area of structures" to be the product of total clear span & width between parapets.

Ref: Column 8

6. RW's with a retained height of 1.5m or more & reinforced soil structures with a retained face at a slope steeper than 45 degrees & retained height 1.5 metres or over.

Ref: Column 9

7. RW's other than in col 8, with an exposed face of 1.5m or more from level in front of wall to top of parapet.