



**EXHIBITION
OF
MUNICIPAL
ENGINEERING
IN
EDINBURGH**

Past and Present

George Street Assembly Rooms

12th.—14th. / June, 1973.

0930hrs. — 1630hrs.

Catalogue



Portobello beach after replenishment - 1973

exhibit 115

CATALOGUE

of

EXHIBITS

**F.R. Dinnis, C.Eng., F.I.C.E., F.I.Mun.E., M.R.T.P.I.
City Engineer and Master of Works
Edinburgh**

June 1973

COVER ILLUSTRATIONS



Gardez-100

exhibit 33



Cauley controversy

exhibit 15



Tunnel Sewer

exhibit 66



Roundabout improvement

exhibit 78

FOREWORD

At our annual conferences in recent years it has become the custom to stage an exhibition illustrating the work of the Institution and its members and these have been very successful. However, this year, having regard to the distance of Edinburgh from the main centres of population of England and Wales, it was decided that the staging of a full scale exhibition would not be justified. However, in order to provide some modest contribution, this small exhibition, confined to municipal engineering in Edinburgh is offered in the hope that it will prove to be of some interest.

Edinburgh is fortunate in possessing a considerable amount of archival material which has provided the basis for the historical part of this exhibition. Although Edinburgh is perhaps best known for its architectural heritage, nevertheless some important and significant municipal engineering activities took place not only in the Georgian and Victorian eras but also during the succeeding decades well into this century.

Thomas Telford designed and built the elegant Dean Bridge between 1829 and 1832. This bridge now carries a volume of motor traffic which was undreamt of in his time, and it is almost certain that this bridge will continue to carry into and from the central area, a vast load of traffic much of which also passes over the Forth Road Bridge; this will continue into the foreseeable future.

Another noteworthy contribution of the Victorian age was the laying of sewers along the valley of the Water of Leith through the city in the years 1864 and 1889. These have achieved the object of removing pollution from the river, so that today the Water of Leith is a clear stream containing large numbers of trout, some of considerable size, which attract many keen fishermen.

Other notable innovations were the Portland Cement Concrete roads built from 1866 over a period of half a century, some of which, until quite recently were carrying modern motor traffic on their original surfaces.

Apart from the historical section, the remainder of the exhibition shows that in Edinburgh there are good examples of current municipal engineering so that although Edinburgh is an ancient city it is by no means a museum piece, and is keeping fully abreast of modern municipal engineering practice.

I wish to take this opportunity to express my sincere thanks to Mr. Paxton, a Principal Assistant in my Department, whose hard and devoted work has made this exhibition possible. I also wish to thank all those other people, too numerous to mention, who have given Mr. Paxton their enthusiastic assistance.

F.R. DINNIS

1st June 1973



EDINBURGH,

November 7th, 1790.

Rectified TABLE

Of the Custom of a Merk on the Pack of all *English* and Foreign Goods brought into the City, or Liberties thereof.

FOR each Horse-Pack, consisting of Sixteen Stone <i>Tross</i> Weight,	L.	5.	0.
and proportionally for Packs of lesser Weight,	—	—	—
Each Cart-draught drawn by one or more Horses, for each Horse	00	11	4
drawing therein,	—	—	—
Each Hoghead of Liqueur, Tobacco, or other Goods,	00	11	4
Each Horse-Load of Liqueur in Butts or in Casks,	00	05	0

All *English* Wool is declared to be free of Custom.

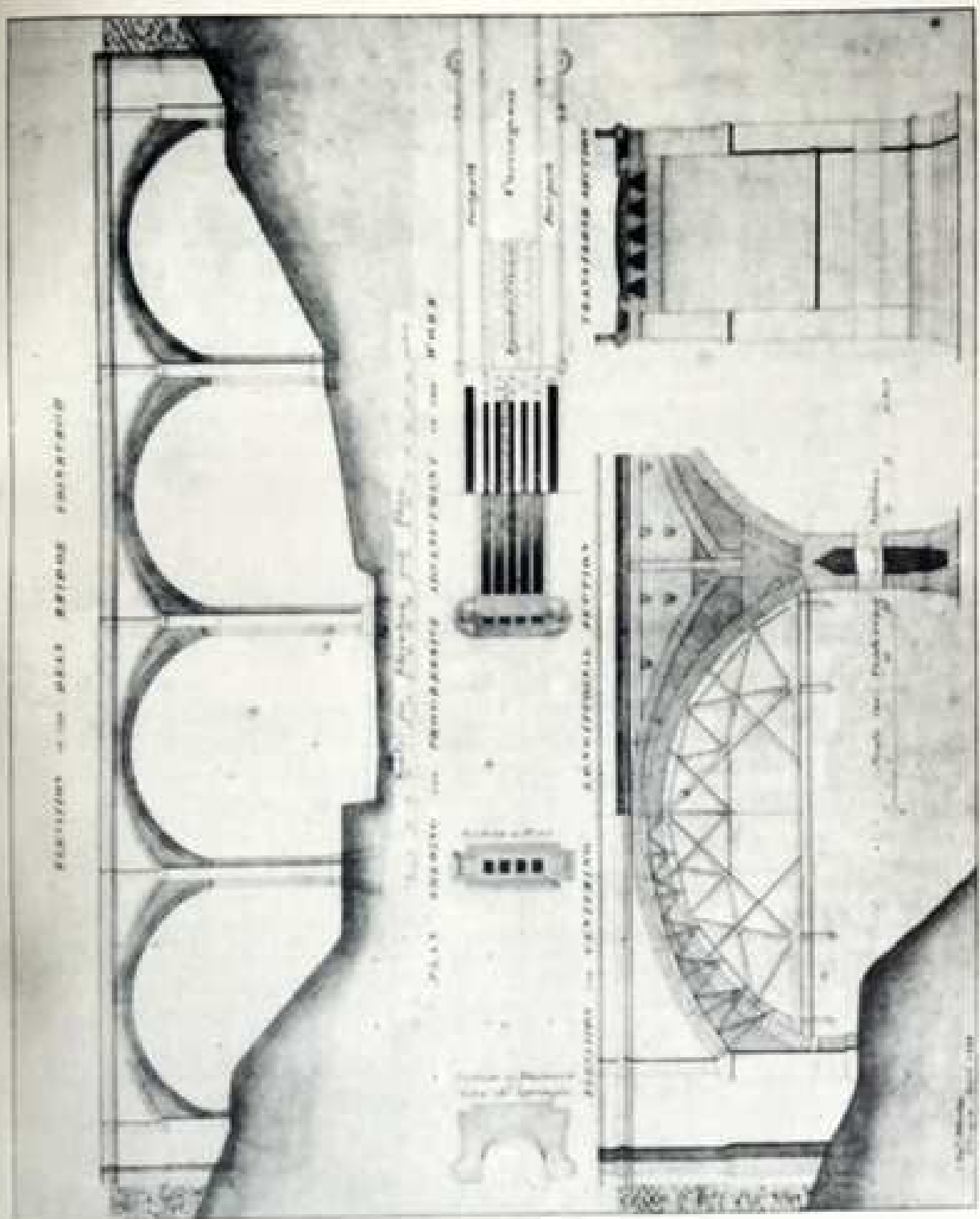
No Goods coming to *Edinburgh* through *Leith*, shall pay Custom to the Tackmen the Merk of the Pack at *Leith*, unless they are lodged one Night there: Neither shall any Goods coming to *Leith* through *Edinburgh*, pay to the Tackmen of *Edinburgh*, unless they lodge one Night therein.

Goods carried off the Road in order to evade paying Custom, upon Conviction thereof, are liable in Payment of double Custom.

The Tackmen is ordained to produce a Table sign'd by the Treasurer, to all Persons who shall demand it, and shall so move as the Dates stated in the above Table, under the Penalty of Fifty Merks Scots, *totum poenae*.

English and Foreign Goods Pack Duty Notice

exhibit 13



Atherton's drawing of Dean Bridge—1833
 exhibit 3

T A B L E

OF THE

DUES payable to the CITY of EDINBURGH in name of CAUSEY-MAIL, and SHOD-CARTS, &c. for Ale and other Goods.

Note.—By an Act passed in the first year of King George II. year 1725, the Petty Port Customs diminished, and for what no Dues are to be demanded or taken, under the penalty of Treason, Malt-dues, are particularly described as wine, &c. The Customs usually levied and collected at any Port or Harbour of the City for such Wine, Spices, Sugars, and Foreign Liquors as shall be brought into the City or Liberties for private use, and not for sale, and for all Fines, all Goods, great or small, of any kind, and for all Hops, Grass, Straw, Linn, Linnseed and Rapeseed of the growth of Great Britain, and Wool, and Wool manufactures, Silks and Haberdashery not mentioned, and for Linen Cloth of all sorts, being the produce of Great Britain, and for Meat, Fish, and Cheese, and for all Irons, Linn, Timber, and all other Materials for Building; all Coals, Peats, Turfs, Fellies, and all manner of Household Furniture, brought into the said City or Liberties thereof.

The Dues to be exacted on all Goods whatsoever (other than those above mentioned, particularly exempted from the Petty Port Customs, from which exemption all Coals, Peats, Turfs, and Timber, to be imported into the City or Liberties thereof, from Leith, by Carts, Sledges, or Snyes, are, by the foresaid Act of Parliament, excepted, and are therefore liable to the Dues after mentioned) to be brought into the City or Liberties thereof, by Horses, Carts, Carriages, Snyes, or any other manner of way, &c.

		Dues
		L. s. d.
F	For every Hackney Coach or Horses yearly (to be paid by the Owners quarterly)	12 0 0
	For every Hackney or hired Chaise yearly (to be paid as above quarterly)	2 0 0
	For all Wine, Spices, and Foreign Liquors for Sale,	0 0 0
	For all Sugars, Tobacco, and Soap, Iron, Lead, and Lead Ore,	0 1 0
	For all Timber, Linnseed and Rapeseed, out of the produce of Great Britain,	0 0 0
	For all Hops, Tea, and other Foreign Commodities,	0 0 0
	For all Ale or Beer for Sale brought from any place into the City or Privileges,	0 0 0
	For every Nine Gallon Tye of Beer or Ale for Sale, and proportionally for lesser or greater quantities under 20 Gallons, brought within the City or Privileges,	0 0 0
	For all Bees, Cinnamon, and other Spices from Leith,	0 1 0
	For all Coals, Peats, and Turfs from Leith,	0 0 0
	For all other Goods whatsoever (other than those above specified, and those above particularly exempted as aforesaid) imported into the City or Liberties thereof, by any person who is a resident Carter, on Carts, Sledges, or Snyes,	0 2 0
		0 1 0
		0 0 0

Each Hackney Coach shall pay Threepence starting each time they shall be so employed, if employed to no other purpose; and the Stage Coaches going between Edinburgh and Glasgow shall be free of Causey-Mail.

The Council ordain all Masters of Hackney-Coaches, Chaises, and Horses, annually to enter their Coaches, Chaises, and Horses, with their respective numbers, in the Tackman's Books, according to the Regulation in that behalf made by the Council the 3d day of March 1776, under the Penalty of Treason Malt-dues.

They also do hereby authorize the Tackman or his Servant (to whom he shall be accountable) to detain the Carts and Horses belonging to such Carters or others who are liable to pay part of the above dues, who shall refuse to pay the same, according to the above Table, and as a Pledge shall be given to the said Tackman or his Servant sufficient to recover and pay the said Dues; **DISCLAIMER**, that whatever shall detain the said Tackman or his Servant in his keeping the aforesaid Dues whatsoever he is entitled, even being legally executed hereof, shall be lost to the use of Treason Malt-dues for every offence, to be payable to the said Tackman.

The Tackman is hereby authorized to exhibit the above Table, sworn by the City Chamberlains or Treasurers for the time being, to each Person, of whom he demands Dues, as shall require it; and to discharge the exact same when it is paid, or the above Table, or the tokens required as above, under the Penalty of Treason Malt-dues, to be paid to the Owner or Owners of such Goods.

Table of Causey-Mail dues—1776
exhibit 16

EXHIBITS

Title Panel and Aerial View of Part of the West of Edinburgh—1972

The view includes the Haymarket One-Way Traffic Scheme (bottom right) and Dean Bridge (top centre).

Historical

(exhibits 1-71A commencing with a simulation of part of the interior of Dean Bridge)

1. **DEAN BRIDGE—1829. TELFORD'S ORIGINAL DRAWING FOR A 3-SPAN BRIDGE WITH ORNAMENTAL EMBELLISHMENTS.**
In commencing the foundations for the south side of the bridge to this design, Telford discovered that "the rocks were found to be so much dislocated that no security could be obtained but at the risk of disturbing the face of the bank, as had happened under a part of Moray Place; prudence, therefore, induced me to change the design into four arches, of 90 feet each, whereby the south abutment is placed on solid rock..." Telford's signature dated 8th May 1829 can be seen at the foot of the drawing.
2. **DEAN BRIDGE PROPOSED CROSS-SECTION—1829**
Photograph of original drawing. The longitudinal cavities under the carriage-way were incorporated into the design to reduce the weight on the foundations and also to facilitate inspection.
3. **DEAN BRIDGE AS BUILT—1833**
Photograph of original drawing. The drawing bears the name of Charles Atherton, the Resident Engineer, and is dated from Glasgow in April 1833. Telford's architectural embellishments were omitted, probably on grounds of cost. The bridge was completed in 1832 and cost £18,556.
4. **DEAN BRIDGE PROPOSED CENTERING FOR SOUTH ARCH—1829**
Photograph of original drawing.
5. **DEAN BRIDGE HOLLOW SPANDREL AND ROADWAY DETAILS—1829**
Original Telford drawing signed and dated 8th May 1829. Note the typical Telford road construction and the concrete and clay layers intended to prevent water entering the cavities. This drawing was made nearly six months before work commenced and the bridge as built varies in detail from the sections shown.
6. **DEAN BRIDGE STALACTITES—1973**
Flashlight photograph in hollow spandrel.

7. **DEAN BRIDGE INSPECTION—1973**
 Photograph of a member of staff in a hollow spandrel traversing the extrados of an arch near its crown. The corbelling at the top of the spandrel is readily identifiable in exhibit 5. At the present time the bridge carries in excess of six million vehicles per annum.
8. **DEAN BRIDGE**
 Photograph of the downstream face of the bridge.
9. **DEAN BRIDGE—HOLLOW SPANDREL UNDER FOOTWAY—1972**
 Photograph of a workman standing on the top side of an asciticious arch. Note the stone cross-tie and the good quality of the internal masonry work.
10. **JAMES CRAIG'S NORTH BRIDGE PROPOSAL—1763**
 Photograph of contemporary engraving. Craig considered that the adoption of his scheme would "...be a public utility as well as a relief to the city from the number of carriages being lessened that at present pass along the narrow streets and of consequence a great saving in the charge the city is put in the expensive paving and repair of these streets." His design was not effected and the bridge was built between 1765 and 1772 to the design of William Mylne.
11. **FOREIGN WINE, BEER AND ALE IMPOST TABLE—1785**
 Photograph of a contemporary notice setting forth the "Good Town of Edinburgh's Impost...payable by all Vintners, Keepers of Taverns or Inns..." In addition to such revenue, from 1693 onwards, the City had been granted by Parliament, a tax of "two pennies Scots" on every pint of ale and beer sold in the City. Part of this duty was subsequently allocated to water supply, harbour improvements, rebuilding of the city walls, causewaying the highways leading to the city and other improvements.
12. **PLAN SHOWING THE GROWTH OF THE CITY FROM THE ANCIENT ROYALTY TO THE YEAR 1920**
 The roads of the Middle District Trust in 1828 are shown on the overlay. Although these roads were mainly outside the city limits at that time, the inhabitants of Edinburgh had been required to contribute towards their upkeep for many years.
13. **ENGLISH AND FOREIGN GOODS PACK DUTY NOTICE—1720**
 Photograph of a contemporary notice setting out the duty payable on goods entering Edinburgh. Some of the money from this source was applied to the construction and maintenance of roads within the Ancient Royalty of the City.
14. **BRANCHES OF CITY REVENUE SET BY PUBLIC ROUP. LATE 18th CENTURY**
 Revenue was obtained from an imposition on wines; shore-dues at Leith; the weigh-house; Leith weigh-house and timber bush; House of Muir and sheep

slakes; land and flesh markets and tallow tron;...sho'd carts and causey mail... etc. Some of this revenue was applied to the construction and maintenance of roads, possibly much, if not all of that derived from sho'd carts and causey mail.

15. **REDUCING THE CROWN OF THE CAUSEY CONTROVERSY—HIGH STREET—1785.**
Photograph of early engraving from John Kay's "Series of Original Portraits & Caricature Etchings... 1877". The city authorities commenced the reduction of the excessive crown of the causey, but the depth of excavation in places exceeded 5 feet. Public opposition was aroused and the project was dropped. In the background the proponents, represented by the Lord Provost, excavate in the road, while the objectors fill it in again.
16. **TABLE OF DUES PAYABLE TO THE CITY IN THE NAME OF CAUSEY MAIL—1776.**
Photograph of early notice. Edinburgh and Glasgow stage coaches travelled free of causey-mail.
17. **VIEW OF CANONGATE INCLUDING THE CAUSEY—MID TO LATE 18th CENTURY**
Photograph of a view drawn by The Hon. John Elphinstone, Engineer. An engraving from Arnot's "*History of Edinburgh... 1788*"
18. **PLAN OF THE ROADS IN THE MIDDLE DISTRICT TRUST—1828**
Photograph of contemporary engraving. Note the distinction between the City and Trust roads and between causeway and metalled construction.
19. **VIEW OF WATERLOO PLACE LOOKING TOWARDS PRINCES STREET AND SHOWING REGENT BRIDGE NEARING COMPLETION—c.1819**
Photograph of early engraving. The engineer for this "London Road" approach to the "New Town" was Robert Stevenson, (Grandfather of R.L.S.) The Middle District Trust made a substantial contribution to this improvement.
20. **REPORT OF JOHN LOUDON M'ADAM ON THE TURNPIKE AND OTHER HIGH ROADS IN THE COUNTY OF EDINBURGH (INCLUDING THE MIDDLE DISTRICT)—1819.**
Photograph of contemporary report. Macadam found the roads in a defective state and recommended measures for their improvement. These measures included the appointment of a General Surveyor for the County "...acquainted with the principle of Road-making in all its various details, so as to be able to instruct as well as to direct the Sub-Surveyors. He ought to be a gentleman of education and station in society, that may give weight and authority sufficient to suppress any improper prejudice or bias, contrary to the public interest..."

21. **COUNTY OF EDINBURGH TOLL NOTICE—1803**
 Photograph of contemporary notice setting forth the tolls payable for different types of transport. No weighing of vehicles was called for by the County at this time but tolls increased with the number of horses pulling.
22. **MIDDLE DISTRICT ROAD MONEY NOTICE—1822**
 Photograph of contemporary notice setting forth a table of rates payable by householders according to the rentable value of their houses.
23. **NOTICE TO CONTRACTORS—1839**
 Photograph of contemporary notice inviting estimates for quarrying the best whinstone within the Wright's Houses and Straiton Branch of the Lasswade District of Roads.
24. **NOTICE TO CARTERS—1839**
 Photograph of contemporary notice inviting estimates for carting stones from Blackford Quarry to places on the Lasswade District of Turnpike Roads.
25. **MIDDLE DISTRICT ROAD TRUST CONSTITUTION—c.1821**
 Photograph of contemporary handbill giving a brief account of the constitution, development and objects of the Trust since its formation c.1759.
26. **NOTICE INVITING INFORMATIONS AGAINST PERSONS LAYING DOWN RUBBISH OR DUNG ON ROADS—c.1803**
 Photograph of contemporary notice.
27. **TOLL TICKETS—1883**
 Facsimile of four tickets. 1883 was the last year that tolls were levied in the area. The Roads and Bridges Act (Scotland) 1878 requiring the abolition of tolls within five years.
28. **ACCOUNT AND RECEIPT OF JOHN FERRIER FOR CARRYING OUT WORKS FOR THE MIDDLE DISTRICT TRUST—1844.**
 Photograph of original account.
29. **VIEW OF MAYFIELD TOLL LOOKING UP CAUSEWAYSIDE TOWARDS CITY—c.1854**
 Copy of original photograph.
30. **VIEW OF CAUSEWAYSIDE WITH MAYFIELD TOLL IN DISTANCE—1854**
 Copy of original photograph. Note the waterbound macadam road metalling.
31. **BRIDGE AGREEMENT PLAN BETWEEN THE NORTH BRITISH RAILWAY COMPANY AND THE MIDDLE DISTRICT ROAD TRUST—WAVERLEY STATION AND EAST APPROACH—1846**
 Photograph of contemporary engraving with MS annotations setting out



Regent Bridge nearing completion--c.1819

exhibit 19

Coltbridge Toll

23 - April 1883

carriage drawn by
12 horse, etc., load,
clears the following bars, viz.

Coltbridge and checks	
Halles quarry	Cameron bank
Mayfield	Fowlburn
Slatford & checks	Cairntows
Stoney port	Merchiston
Goldensacre	Warriston Crue
Fairmilehead	Comely bank
Tynecastle check	Dean park
Bonnington Jock's lodge	Trinity
Seafield Leith links	Southfield
Abbeyhill or Marionville	
Niddry mill	Dean park check
Jordan bridge	Duddingston
Howdenshall	Liberton dams

Toll Ticket--1883

exhibit 27

NOTICE CONTRACTORS.

ESTIMATES are wanted for Quarrying the best Whinstone in the following Quarries within the Wright's Houses and Straiton Branch of the Looswade District of Roads, viz.

Hayside Quarry,	about 400 Cubic Yards.	
Hillend Quarry,	" 2000 "	
Silverburn Quarry,		
	from 900 to 1800	"
Carlop's Quarry,	about 180	"
Kingside Quarry,	" 1400 "	

For further particulars application may be made to Mr Anderson, Surveyor of Roads, Hilton Bridge, near Penicuik, or at the Road Office, County-Rooms, Edinburgh;

Sealed Offers, addressed "Mr E'Larra, Road Office, County-Rooms, Edinburgh," will be received until the first day of April next.

ROAD OFFICE, COUNTY-ROOMS,
Edinburgh, March 14, 1883.

Notice to Contractor--1839

exhibit 23



Sett Laying to Tram Rails at the foot of Leith Walk—c.1905
exhibit 57



Edinburgh's first busway under construction
exhibit 74-5

agreed details relating to bridges crossing roads. A copy of the Buchanan Report relating to these bridges is appended below the plan.

32. **ACT OF COUNCIL REGULATING THE TIME FOR EMPTYING AND LAYING DOWN ASHES, FOUL WATER AND OTHER FILTH AND NASTINESS IN STREETS Etc.—1749**
Photograph of contemporary hand bill restricting these practices, in general, to night-time and early morning.
33. **"GARDEZ-LOO" IN THE COWGATE**
Photograph of old engraving from Sir D. Wilson's *Memorials of Edinburgh in the Olden Time. 1891*". Plate:—*Symson the Printer's House, Cowgate.*
34. **THE CITY CLEANSED AND COUNTRY IMPROVEN—1760**
Photograph of contemporary title page. This publication attempted to improve sanitation within the city. The implements and equipment depicted by woodcuts and numbered are described in "The Explanation of the Plate".
35. **CAPT. TOPHAM COMMENTS ON INSANITARY PRACTICES—1776.**
Photograph of p.15 of "Letters from Edinburgh:..."
36. **EARLY 19th CENTURY SEWER IN THE COWGATE**
Photograph of cross-sectional view of sewer from *"Main Drainage of the City of Edinburgh, 1955"*.
37. **VIEW OF OPEN SEWER AT CRAIGENTINNY—LAST CENTURY**
Copy of early photograph used from *"Main Drainage of the City of Edinburgh, 1955"*.
38. **VIEW OF OLD WAVERLEY BRIDGE AND MARKET STREET—c.1854.**
Copy of contemporary photograph.
39. **VIEW OF MARKET STREET FROM PRINCES STREET—1973**
Photograph showing the Waverley Market (built towards the close of the last century) under demolition. The roof was spanned by main beams and jack arches, two of which can be seen at the right of the view.
40. **LIST OF DUTIES OF THE BURGH ENGINEER AND CITY ROAD SURVEYOR—1908**
From Council Minutes.
41. **VICTORIAN TRAFFIC IN PRINCES STREET—c.1880**
Copy of contemporary photograph. Shortly before this photograph was taken, the tram rails and setts had been relaid on a 9" thick foundation of Portland Cement Concrete under the superintendence of D.C. Proudfoot, City Road Surveyor.

42. **THE NEWINGTON-STOCKBRIDGE HORSE-BUS—c.1850**
Copy of early photograph.
43. **NORTH BRIDGE FROM PRINCES STREET—1885**
Copy of contemporary photograph.
44. **NORTH BRIDGE FROM PRINCES STREET IN 1973**
A contrast.
45. **JOSEPH MITCHELL ADVOCATES CONCRETE ROADS—1866-1870**
Photographic extracts from Mitchell's "*New Mode of constructing the surface of streets*" together with his "*Instructions for making a concrete road*". Mitchell laid a section of concrete carriageway at George IV Bridge in 1866 which can be considered the first successful length of major concrete road in modern Britain.
46. **GILLESPIE CRESCENT—A CENTURY OLD CONCRETE ROAD**
Photograph of one of Edinburgh's earliest surviving concrete roads. Following on Mitchell's initiative, between c. 1873 and 1910, concrete carriageway totalling 5½ miles in length was laid in over one hundred Edinburgh and Leith streets. Although the concrete was surfaced over with a thin layer of asphalt some years ago, a small area of concrete can still be seen at the entrance to the Crescent.
47. **VIEW OF COLINTON BRIDGE c.1920**
Copy of contemporary photograph. Shortly afterwards, the bridge was widened.
48. **COLINTON BRIDGE IN 1973**
A contrast.
49. **PRINCES STREET—1859**
Copy of contemporary photograph taken from near Hanover Street looking east. The sett causeway is clearly visible.
50. **LAYING TRAM RAILS IN LEITH WALK—c. 1920**
Copy of contemporary photograph.
51. **SETT LAYING TO TRAM RAILS AT THE FOOT OF LEITH WALK—c.1905**
Copy of contemporary photograph.
52. **SCOTT MONUMENT UNDER CONSTRUCTION—1844**
Copy of contemporary calotype.
53. **OLD NORTH BRIDGE DRAWING—1869**
Original Drawing signed by D.C. Proudfoot, City Road Surveyor.

54. **VIEW OF OLD NORTH BRIDGE—c.1853**
Copy of contemporary photograph.
55. **PRESENT NORTH BRIDGE UNDER CONSTRUCTION—LAYING OF FOUNDATION STONE—1896**
Copy of photograph.
56. **WORKING ON TRAMRAILS**
Copy of photograph.
57. **LAYING TRAM RAILS AT BEND IN CORSTORPHINE ROAD NEAR ZOO—c.1920**
Copy of photograph.
58. **SELECTIONS FROM "THE SURVEYOR" REPORTING OF THE 25th ANNUAL CONFERENCE OF THE ASSOCIATION OF MUNICIPAL AND COUNTY ENGINEERS IN 1898**
Reproductions of various pages (1, 4-6, 88-9, 98, 152-4) containing a wealth of detail relating to the scope and practice of Municipal Engineering in Edinburgh at that time.
59. **MITCHELL'S EXPERIMENTAL USE OF CONCRETE IN THE CARRIAGEWAY OF GEORGE IV BRIDGE—1866**
A contemporary MS record of costs incurred in Mitchell's experimental use of Portland Cement Concrete both as a sett causeway foundation and running surface. The Portland Cement cost about £2.60 per ton and was obtained from Hilton & Co. of London. It was shipped to Leith for 10/- per ton. Broken whinstone aggregate was obtained locally at 6/- per cu.yd. and dressed granite setts from Aberdeen at 24/- per ton. From the abstract of costs, it can be seen that the Aberdeen granite causeway laid on 3" concrete cost 19.94 shillings per sq.yd. (note the decimals!) and the 6" thick concrete carriageway 8.047 shillings per sq.yd.
60. **EARLY CONCRETE ROADS IN EDINBURGH**
Concrete Quarterly No.24, March 1955. The photograph shows Blackwood Crescent, a concrete road constructed in 1873, as it appeared in 1955. It has subsequently been overlaid with asphalt, but some idea of the very low maintenance costs of this type of road can be gauged from the fact that the total cost of maintaining the Crescent from 1873 until 1920 was only £40.
61. **SPECIMEN OF EARLY GROUTED CONCRETE ROAD—1878**
This cube has been cut recently from the carriageway West Arthur Place constructed in 1878. The concrete was formed on a blinded and rolled stone bottoming 6" thick as follows:— A 4½" thick layer of 1" whin road metal was spread uniformly over the bottoming and grouted with a mixture of fine gravel riddled out of Fisherrow gravel and Robin & Co's best Portland Cement. The cement used was to be capable of sustaining a tensile

strain of 600 lbs. on the superficial area of 2½" of the standard test block after being immersed 7 days in water. The grout was mixed in a patent steam mixing machine and then spread, beaten and 'equalised' into the road surface "in a most careful and tradesmanlike manner".

62. **SPECIFICATION FOR CONSTRUCTION OF WEST ARTHUR PLACE—1878**

Part of the original specification for exhibit 63. The Contractor was supplied with a concrete mixing machine for which he had to pay the Road Trust £1.10/- per day. A high standard of workmanship was particularly emphasised "...as the whole after-strength and durability of the carriageway depends much on this part of the contract."

63. **THEODOLITE BY DUNN—c.1870**

5" cradle theodolite used in the City Road Surveyor's department.

64. **THEODOLITE BY ADIE & SON—c.1870**

5" cradle theodolite in brass used in the Burgh Engineer's department. The label in the box lid bears the signature of John Cooper who joined the Department in 1871 and ten years later was appointed Burgh Engineer. Details of Cooper's career are given in exhibit 58.

65. **DUMPY LEVEL BY BRYSON—c.1855**

66. **EIDOGRAPH BY ADIE & SON—c.1860**

This instrument was used for accurately reproducing drawings and, enlargements or reductions of drawings. It was invented by Professor Wallace of Edinburgh University in 1821 and subsequently came into wide spread use.

67. **CITY ENGINEER'S BATON OF OFFICE**

Wooden baton measuring 115 x 14mm. dia. with ornamental silver devices at each end for impressing the Corporation and Royal Arms into wax seals. It bears an ornamental centre band in silver on which is inscribed "CITY ROAD SURVEYOR". The hall marks date the baton at 1909.

68. **STALAGMITE FROM DEAN BRIDGE SPANDREL**

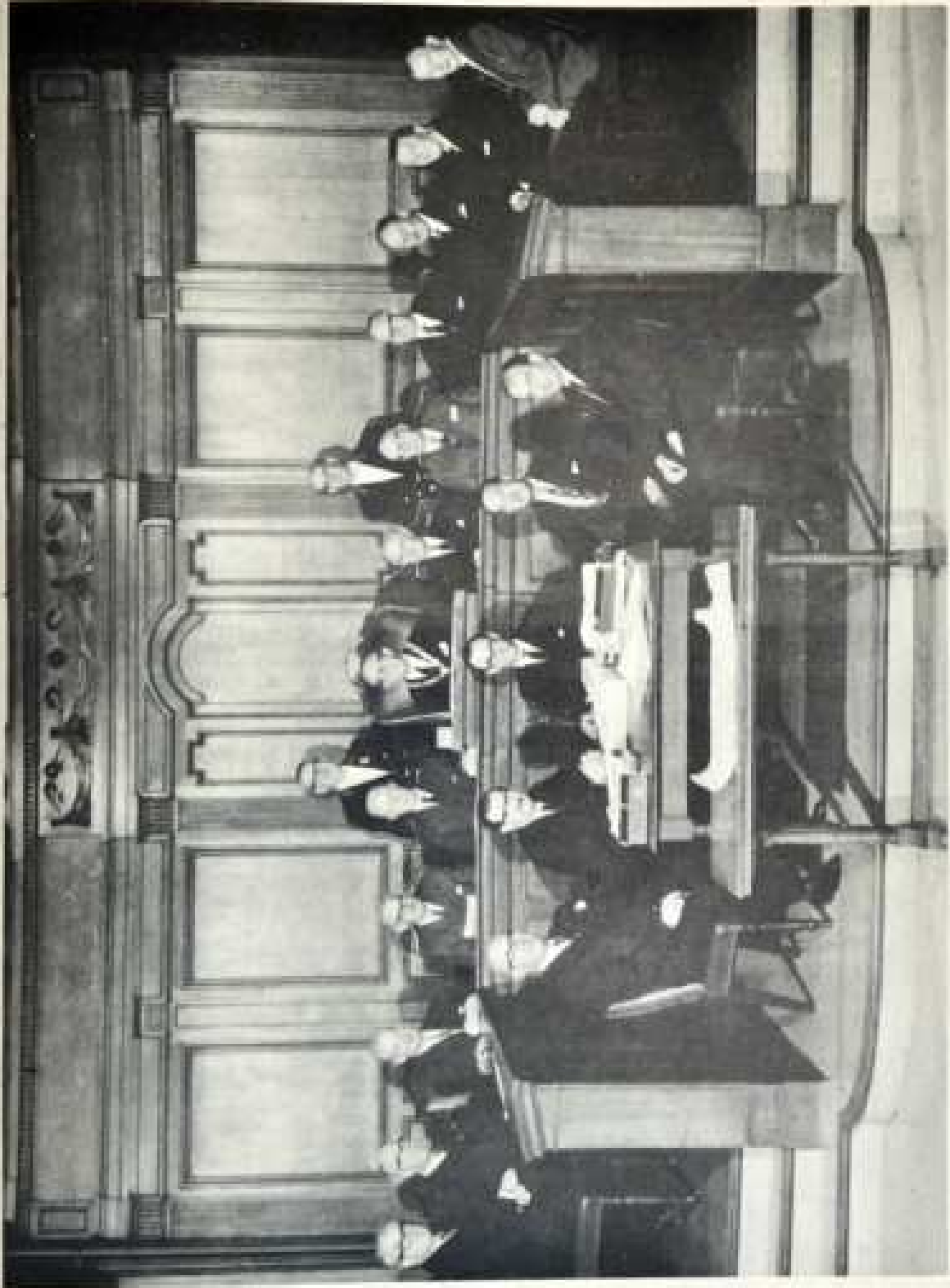
69. **LEITH POLICE PAVING DEPARTMENT STAMPING TOOL—19th CENTURY**

70. **ORIGINAL PLAN OF LEITH WALK DISTRICT OF ROADS BY THOS. GRAINGER—1823**

In later years Grainger became one of the leading Scottish railway engineers.

71. **DISPLAY OF OLD TOOLS AND EQUIPMENT.**

71a. **CONTEMPORARY FOLDERS OF PLANS: EDINBURGH AND LEITH SEWERAGE—1863 and HOUSING FOR THE WORKING CLASSES—1900**



Dean of Guild Court—1968

exhibit 88



Sewage works under construction on reclaimed land

exhibit 79

Slide Theatre

A sequence of eighty coloured slides illustrating Municipal Engineering in the City.

Traffic Management

(exhibits 72-3)

72. PRINCES STREET—LINKED AUTOMATIC TRAFFIC SIGNALS SCHEME

The Scheme embraces the full length of Princes Street and operates on a linked flexible progressive system. Initial signal settings at the individual intersections were calculated using a computer program developed in the Traffic Management Section. Offsets for linking were obtained from the T.R.R.L. "Transyt" program which is designed to minimise delay throughout a network.

The model illustrates the "P.M. Peak" program which is one of four operating daily to take account of the varying traffic patterns. The panel behind the model shows the node diagram used for input to the "Transyt" program and the Time/Distance diagram derived from the output.

73. CONTROLLED PARKING SCHEME

The panel shows the extent of this scheme which will control parking in 1000 hectares of the central area of the city and restrict waiting on 40 km of designated main traffic routes.

Parking will be controlled to a large extent by meters in the central area and by ticket-issuing machines in the peripheral area. Parking places reserved solely for the use of residents in these areas will also be provided. On completion of the scheme, 11,100 parking spaces will be available, 6700 for use by the general public and 4,400 by residents.

Bridges and Structures— Temporary West Approach on former Railway Land— Edinburgh's First Busway . (exhibits 74-76)

74. PHOTOGRAPHS OF PROPOSED SITE

75. PLAN OF SITE

The road is 2.4 km long extending from Westfield Road (near Murrayfield Rugby Ground) to Lothian Road in the city centre and has additional accesses to and from Morrison Street, Canning Street, and Dundee Street. The existing roads in this corridor of travel are presently congested at peak times and the new facility is expected to improve travel times, particularly for public transport. The road is intended to give buses direct and rapid access to the city centre and also to cater for cars and light vehicles particularly in association with the large car parks adjoining Morrison Street and Lothian Road.

Four new steel bridges are to be built and the headroom under four existing bridges is to be increased by lowering the formation. To form the road, the existing slag ballast will be scarified, blinded with fines and reshaped to form the base for a 100 mm. thick asphalt surface.

76. **PHOTOGRAPHS OF WORK IN PROGRESS**

Major Projects—A71 Calder Road
(photograph exhibits 77-81)

77. **GENERAL VIEW OF NEW DUAL CARRIAGEWAY LOOKING EAST**
The total length of the new dual carriageway is 2.4 km, with large roundabouts at three major intersections. A service road has been provided along most of the south side so that full separation of through and local traffic can be achieved. The areas enclosed by the roundabouts have been lowered to form pedestrian concourses linking the underpass system. Three larger underpasses permit pedestrians to cross the road between roundabouts.
78. **ROUNDAABOUT AT INTERSECTION OF BROOMHOUSE ROAD AND CALDER ROAD**

A pedestrian underpass system links the four quadrants to the central concourse. Ramped approaches lead to each underpass and, in addition, stairways have been provided where this affords a shorter route e.g. as on the nearest subway.

Drainage and Sewage Disposal
(exhibit panels 79-86 & model 87)

79. **GENERAL INFORMATION AND CREDITS**
A new sewage treatment works is being constructed on 22.4 ha. (55.5 acres) of reclaimed land at Seafield. The works will cover an area of 10 ha. (24.7 acres) and have an ultimate dry weather flow of 3.12 cumec (59 mgd).

18 km of new interceptor sewer are being constructed with a maximum diameter of 3086 mm.

Treated effluent is discharged into the Firth of Forth via an effluent outfall tunnel 2.8 km. in length and 3660 mm. in diameter.

The total estimated cost of the scheme is £18.08 million.

80. **DIAGRAMS OF EXISTING AND PROPOSED SEWAGE DISPOSAL ARRANGEMENTS**

81. **FLOW DIAGRAM OF TREATMENT WORKS AND STATISTICS SHEET**
82. **PROGRESS TO DATE**
83. **TIDAL PATTERNS, EFFLUENT OUTFALL DETAILS, DISTRIBUTION CHAMBER DETAILS, OVERFLOW CHAMBER DETAILS**
84. **PHOTOGRAPHS OF SEWAGE TREATMENT WORKS IN PROGRESS**
85. **PHOTOGRAPHS OF SEWAGE TREATMENT WORKS IN PROGRESS INCLUDING BUND WALL, WAVE WALL Etc.**
86. **PHOTOGRAPHS OF SEWER CONSTRUCTION IN TUNNEL, OPEN-CUT AND HEADING**
87. **MODEL OF PROPOSED SEWAGE TREATMENT WORKS AT SEAFIELD**
The model has been constructed to a scale of 1 in 300 and illustrates the proposed layout of treatment units, buildings and roads within the treatment works.

A general indication of the flow pattern through the treatment works is given by the lighting sequence as detailed below:

- (a) **FIRST SEQUENCE**—This indicates the flow path of crude and treated sewage for flows up to 10.14 cumecs (193 mgd). The treatment processes include screening, grit removal and primary settlement in circular sedimentation tanks prior to discharge through the effluent outfall.
- (b) **SECOND SEQUENCE**—This indicates the flow path of stormwater discharge resulting from flows in excess of 10.14 cumecs (193 mgd). Stormwater flows will be treated by settlement in rectangular stormwater tanks prior to discharge through the effluent outfall.

Dean of Guild

(photographic exhibits 88-93)

88. **DEAN OF GUILD COURT IN SESSION—1968**
The primary duty of the Court is to exercise control in the interests of the public and of adjoining proprietors with regard to projected building operations within the city. This control is made operative by the requirement that all persons proposing to execute certain operations affecting buildings must first obtain from the Court a Warrant to do so and must execute the work in strict conformity therewith. The value of work dealt with by the Court in the year 1972-73 is nearly £40,000,000. The number of Full Petitions granted amounted to 3328 and 1548 Minor Applications were sanctioned.

89. **FIRE DAMAGE TO THE RUTLAND PICTURE HOUSE CANNING STREET**
This view shows the effect of fire on unprotected steel construction during the erection of a building for which a Court Warrant had been issued.
90. **BUILDING IN EASTER ROAD SHOWING BULGE ON GABLE (LOOKING UP)**
Statutory Notices were served on the owners to carry out this major repair.
91. **TUBULAR SHORING ERECTED OVERNIGHT TO DEFECTIVE GABLE SHOWN IN EXHIBIT 90.**
92. **ST. JOHN'S CHURCH, CHARLOTTE STREET, LEITH, DEVELOPED MAJOR STRUCTURAL DEFECTS**
The building became unsafe and was ordered to be demolished under a Court Warrant.
93. **VIEW OF ST. JOHN'S CHURCH SITE AFTER DEMOLITION**

Major Projects—A901 Leith to Granton Road—Construction of Retaining Wall by "Terre Armée" Technique (photographic exhibits 94-7)

94. **FACE OF PARTLY COMPLETED WALL SHOWING ARRANGEMENT OF INTERLOCKING PRECAST CONCRETE FACING PANELS**
These panels are cast to a standard 1.5 m. square module 180 mm. thick for normal applications or 220 mm. thick for special duties.
95. **BACK OF WALL SHOWING ATTACHMENT OF EARTH REINFORCING STRIPS TO FACING UNITS**
The strips are 75 mm. wide by 3 mm. thick in mild steel, galvanised steel or aluminium alloy, or 1.5 mm. thick in stainless steel depending on the application. In this case, as the spent oil shale fill has a high sulphate content, stainless steel is being used.
96. **PLACING OF FILL OVER REINFORCING STRIPS**
The reinforcing strips are at 375 mm. vertical spacing and two layers of fill are spread and compacted between each layer of strips.
97. **FACE OF COMPLETED WALL BEFORE CASTING OF IN-SITU COPE**
In order to provide data for a research project, a number of strips were fitted with electrical resistance strain gauges. The gauge leads were brought out through small polythene cable ducts into the instrument, but near the highest point of the wall.

Bridges and Structures

(photographic exhibits 98-102)

98. **WESTER HAILES FOOTBRIDGE NO. 3**
In-situ concrete parabolic three-pinned arch with open spandrels.



'Terre Armée' retaining wall under construction
exhibit 95



'Terre Armée' retaining wall nearing completion
exhibit 97



Bridges at Wester Hailes
exhibit 99



Management accounting using desk computer
exhibit 140

99. **WESTER HAILES FOOTBRIDGE NOS. 1 and 2**
In-situ concrete cantilevers and abutments with precast pre-stressed suspended span.
100. **PRECAST UNIT BEING LOWERED INTO POSITION**
101. **FOOTBRIDGE OVER BROOMHOUSE ROAD AT FORRESTER SCHOOL**
Precast pre-stressed hollow box section supported on in-situ concrete columns.
102. **LANARK ROAD BRIDGE OVER THE WATER OF LEITH**
Two span road bridge constructed using precast inverted T-beams of pre-stressed concrete with in-situ concrete infill and topping.

Coast Protection--Beach Replenishment at Portobello
(photographic exhibits 103-124 and map 125)

103. **BUCKET DREDGER FILLING BARGE WITH SAND**
104. **SAND-FILLED BARGE LEAVING DREDGER**
105. **TUG ASSISTING SELF-PROPELLED BARGE**
106. **FULL BARGE APPROACHING RECLAMATION DREDGER**
107. **RECLAMATION DREDGER SUCKING SAND AND WATER FROM BARGE TO PUMP ASHORE**
108. **END OF PIPELINE FROM DREDGER**
Reclamation dredger in background connected to sea bed pipeline.
109. **PIPELINE ON BEACH**
The pipeline was extended as the beach was made up.
110. **SAND AND WATER DISCHARGING FROM PIPE**
500 tonnes of sand were deposited in 15 minutes once every hour, 24 hours per day.
111. **BULL-DOZER FORMING TEMPORARY BUND TO RETAIN SAND**
112. **OPERATIONS ON BEACH TO THE EAST**
The beach pipeline leads along the sea-bed to the dredger (on right).
113. **GRADING THE BEACH TO ITS FINISHED LEVEL**

114. **TIMBER GROYNES TO PROTECT SAND**
Five timber groynes and one gabion groyne have been provided to contain the newly formed beach.
115. **AERIAL VIEW OF FINISHED BEACH**
116. **PANORAMIC VIEW OF OPERATION IN PROGRESS**
117. **AERIAL VIEW OF JOHN STREET (Before)**
118. **AERIAL VIEW OF JOHN STREET (After)**
119. **THE BEACH AT JAMES STREET (Before)**
120. **THE BEACH AT JAMES STREET (After)**
121. **THE BEACH AT BRUNSTANE ROAD NORTH (Before)**
122. **THE BEACH AT BRUNSTANE ROAD NORTH (After)**
123. **VIEW FROM THE JOPPA END (Before)**
124. **VIEW FROM THE JOPPA END (After)**
125. **LOCATION MAP**

**Marshall Report T.R.R.L. Highway Maintenance System—
Developed under Contract by Edinburgh Corporation**
(exhibits 126-133)

126. **FIELD INSPECTION—PRINCES STREET**
Structural and inventory survey being undertaken in Category 2 Road.
127. **FIELD INSPECTION FORM**
Form used in noting structural details, defects inventory list, etc.
128. **TRANSCRIPTION FORM**
Form used for transcribing information from field inspection information in code suitable for punching on input cards.
129. **PHOTOGRAPH OF EDINBURGH CORPORATION ICL SYSTEM 4/50
COMPUTER**

130. SUB-SECTION LISTING

In this type of report sections will normally be listed in order of street and sub-sections in topographical order with the section for ease of reference by the engineer. In addition to basic section data the report contains rating and treatment information for each sub-section selected for treatment.

131. TREATMENT LENGTH LISTING

This report is produced for each treatment. Sub-sections will appear in the same order and with the same identification as in the sub-section lists. Contiguous sub-sections requiring the same treatment are formed into treatment lengths to which average ratings and priorities within treatment are assigned.

132. HISTOGRAM

Histograms are produced per section in street sequence. They can be printed for pavement, road-side or other set of defects and each will be in two parts, a micro-section histogram (10 metre units) and a sub-section histogram (100 metre units).

133. MAP PRINT-OUT

This report is produced in the same sequence as the histograms. It contains the information collected during the survey presented in a more convenient form for the engineer.

Time-Sharing Computer Terminal Display

(exhibit panel 134-5 and terminals 136-7)

134. METHOD OF USING TIME-SHARING COMPUTER FACILITIES

135. APPLICATIONS OF THE TERMINALS

Perspective drawing to evaluate the appearance of a proposed structure in relation to existing development. The computer drawing shows a perspective view of a proposed tunnel portal and approach, with existing development, as it would appear from a selected viewpoint. The view from any other selected point can be seen on the visual display unit by request.

Sample print-outs of the following applications are shown:- Frame Structure Analysis; Cantilever Retaining Wall Design; "Furnessing" of Traffic Flow Tabulations; Storm Sewer Design; Vertical Alignment of Roads; Analysis of Structural Sections; and Analysis of 2 Span Beam.

136. COMPUTER TERMINAL

137. VISUAL DISPLAY UNIT

Management Accounting

(exhibit panels 138-9 and desk computer 140)

- 138— This display demonstrates data processing of management information
140. using a small computer. The items illustrated include Expenditure Control,
Job Costing of Direct Labour Works and Design Engineering Costing.

Members of staff are in attendance to discuss systems and the equipment.
Literature is available for anyone requiring further information.

Cleansing Department—Powderhall Refuse Disposal Plant

(model exhibit 141)

141. SIXTEEN FEET TO ONE INCH SCALE MODEL OF PLANT

This new plant has refuse bunkers with a level capacity of 3058 cubic metres.
The design throughput of crude refuse by direct incineration is 25 tonnes/hr.
in units each of 12½ tonnes/hr.

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