APPENDIX 5.3   **ADJUSTMENT OF CONSULTANTS' REMUNERATION BY THE CIVIL ENGINEERING WORKS INDEX**
(Applicable only to certain old ongoing agreements)

Introduction

This Appendix describes the fee adjustment measures promulgated originally in L&WB TC No. 9/89 and WBTC No. 9/90, but <u>no longer used in new assignments since May 1991</u>, to compensate the eroding effects of inflation on consultants' fees which are calculated as a percentage of the Cost of Works. The relevant paragraphs from the original circulars are basically subsumed hereunder, without updating or extension of the relevant data quoted in the circular, in order to retain the background and requirements for reference. The measures shall not be used in new assignments.

Civil Engineering Works Index

2. The Civil Engineering works Index (CEWI) has been developed as a means of relating the costs of civil engineering works at current prices to those at 1980 when the current standard Scale of Percentage Fees (**Annex A**) was first established. The CEWI is based on the labour index and various materials costs indices published monthly by the Census & Statistics Department. The weighting factors used for compiling the CEWI are based on a comprehensive review of over 350 civil engineering works contracts during the period 1984-1987 from the then Civil Engineering Services Department, Water Supplies Department, Housing Department, Highways Department and former Territory Development Department. A list of the weighting factors adopted and the values the CEWI calculated for the period since 1980 are given at **Annex B**.

The CEWI Remuneration Method

3. The CEWI remuneration method involves the following procedures :-

(a) The Net Cost of the Works for any construction contract should be deflated by the ratio of the Civil Engineering Works Index (CEWI) in 1980 to the CEWI at the close of tenders for that contract. The Net Cost of any part of the Works for which tenders have not yet closed should be deflated by multiplying the latest estimate of the Net Cost of that part of the Works by the ratio of the 1980 CEWI to the CEWI at the time of the latest estimate.

(b) The deflated Net Cost of the Works obtained by summing the deflated Net Costs of the various parts of the Works should then be used to obtain the overall fee percentage from the Scale of Percentage Fees, which should then be applied to the Cost of the works, Net Cost of the Works and Adjusted Net Cost of the Works to calculate the fees due.

(c) The additional fee on the reinforced concrete portion and on the structural metalwork portion of the Works may also be calculated in the same manner.

4.   A worked example of the CEWI remuneration method is at **Annex C**.

Application

5.   The CEWI remuneration method applies to those old engineering Investigation, Design & Construction (IDC) agreements <u>signed on or after 1 July 1989</u> [No longer applicable since May 1991].

6.   This method also applies to the following types of certain old IDC agreements <u>signed before 1 July 1989</u>, subject to mutual agreement between the consultants and Government:

     (i)   Single-contract agreements where the closing date of tender is on or after 1 July 1989.

     (ii)   Multi-contract agreements where the closing dates of tender of <u>all</u> contracts in the agreement are on or after 1 July 1989.

     (iii)   Individual "phases" of a multi-contract agreement where there are provisions for the calculation of fees for each "phase" of the work <u>and</u> that the closing dates of tender of <u>all</u> contracts for that phase are on or after 1 JULY 1989.

7.   The CEWI remuneration method and the method for dealing with uncharacteristic tenders as described in the following paragraphs shall be applied as a package in the existing agreements described in Para. 6 above.

The Method for Adjustment to Uncharacteristic Tenders

8.   For the purpose of calculating fees, adjustment to an uncharacteristic tender can be made as follow :-

    (1)   Inspect the corrected tender prices for a contract and exclude those tenders which do not meet contract provisions,

    (2)   Calculate the average tender price ($\bar{p}$) and the standard deviation (σ) of the tender prices based on the corrected tender prices,

    (3)   Calculate the characteristic factor, CF(T), of the accepted tender based on the corrected tender price of the accepted tender *(p(t))*.

    (4)   If CF(T) > 1.922, then the accepted tender is considered as uncharacteristically low.   Then CF is taken as 1.922 for calculation of the adjusted tender price in (6) below.

    (5)   If CF(T) < 0.612, then the accepted tender is considered as uncharacteristically high.   Then CF is taken as 0.612 for calculation of the adjusted tender price in (6) below.

(6) For an uncharacteristic tender identified by (4) or (5) above, Adjusted tender price (p) = Average tender price ($\bar{p}$) - CF × standard deviation (σ),

(7) Adjustment factor = Adjusted tender price (p)/Accepted tender price (p(t)),

(8) Adjusted Cost of Works = Adjustment factor × Cost of Works.

The mathematical derivation of the Characteristic Factor (CF(T)) for the accepted tender and worked examples illustrating the application of the proposed method to uncharacteristically low and high tenders can be found at **Annexes D, E and F**.

Application

9. The method for adjustment to uncharacteristic tenders applies to the relevant engineering Investigation, Design and Construction (IDC) agreements signed on or after 1 July 1989 [No longer applicable since May 1991].

10. Subject to mutual agreement between Government and the consultants, the method also applies to some old agreements for those contracts whose tender closing date is on or after 1 July 1989.   The above method and the remuneration method using the Civil Engineering Works Index shall be applied as a package in those relevant existing agreements.

11. Some old agreements have adopted another type of method for dealing with uncharacteristic tender as promulgated originally in LWBTC Nos. 9/84 and 2/85.   This another type of method is described at **Appendix 5.2** for reference.

Scale of Percentage Fees

Table 1

Buildings, Civil Engineering, Electrical and Mechanical works

	Cost of Works				Fees		
					11.5% of the Cost of Works		
	Up	to	$200,000	$23,000	+9.2%	bal. over	$200,000
From	$200,000	to	$500,000	$50,600	+8.05%	"	$500,000
	$500,000	to	$800,000	$74,750	+6.9%	"	$800,000
	$800,000	to	$1,500,000	$123,050	+6.325%	"	$1,500,000
	$1,500,000	to	$3,500,000	$249,550	+5.75%	"	$3,500,000
	$3,500,000	to	$7,000,000	$450,800	+5.175%	"	$7,000,000
	$7,000,000	to	$12,000,000	$709,550	+4.8875%	"	$12,000,000
	$12,000,000	to	$20,000,000	$1,100,550	+4.6%	"	$20,000,000
	$20,000,000	to	$100,000,000	$4,780,550	+4.3125%	"	$100,000,000
Over	$100,000,000						

Table 2

Additional Fee on the Reinforced Concrete Portion of the Works

	Cost of the Reinforced Concrete Portion of the Works			Additional Fees			
Under	$4,000,000			4.025% of the cost of the Reinforced Concrete Portion of the works			
From	$4,000,000	to	$6,000,000	$161,000	+2.875%	bal. over	$4,000,000
	$6,000,000	to	$8,000,000	$218,500	+2.3%	"	$6,000,000
Over	$8,000,000			$264,500	+1.725%	"	$8,000,000

Table 3

Additional fee on the Structural Metalwork Portion of the Works

For structural metalwork, the additional fee shall be one half of that for reinforced concrete, as calculated from Table 2 above.

Weighting factors and list of CEWI since 1980

Labour and Material Index	Weighting Factors
Labour	0.42064
Aggregates	0.05133
Bitumen	0.03286
Bricks	0.02503
Diesel fuel	0.10026
High tensile steel bars 10 mm - 40 mm	0.10297
Light structural steel	0.03524
Round mild steel bars 20 mm and above	0.02689
Round mild steel bars 16 mm and above	0.03120
Portland Cement (Ordinary)	0.11065
Timber	0.06293

Weighting factors and list of CEWI since 1980 (Cont'd)

Year	Quarter	Civil Engineering Works Index (CEWI)
1980	Annual	100
1981	1st Quarter	105.0
	2nd Quarter	108.2
	3rd Quarter	109.4
	4th Quarter	111.8
1982	1st Quarter	114.5
	2nd Quarter	115.4
	3rd Quarter	115.9
	4th Quarter	117.8
1983	1st Quarter	119.4
	2nd Quarter	121.6
	3rd Quarter	124.9
	4th Quarter	132.6
1984	1st Quarter	133.0
	2nd Quarter	133.8
	3rd Quarter	134.3
	4th Quarter	133.9
1985	1st Quarter	133.9
	2nd Quarter	133.9
	3rd Quarter	133.0
	4th Quarter	133.2
1986	1st Quarter	135.8
	2nd Quarter	134.5
	3rd Quarter	134.1
	4th Quarter	136.5
1987	1st Quarter	141.7
	2nd Quarter	144.7
	3rd Quarter	153.4
	4th Quarter	164.8
1987	1st Quarter	172.9
	2nd Quarter	174.9
	3rd Quarter	180.5
	4th Quarter	188.7

<u>Worked example of application of the CEWI remuneration method</u>

1. A project consists of three contracts :

  (i)   Contract No. 1 has been completed. There has been a delay of over 90 days between the substantial completion of design/contract stage and closing date of tender and an adjustment factor of say 0.95 to the Net Cost of Works for calculation of the Design Stage Fee is obtained from the standard Adjustment Clause.
  (ii)   Contract No. 2 is on-going.
  (iii) Contract No. 3 has not been tendered.
  (iv)   For all three contracts, it is assumed that adjustments in respect of uncharacteristic tenders need not be made.

Contract No.	Estimated Cost of Works	Tender Sum	Final Contract Sum	Total PFA*	CEWI** at tender closing date	Current CEWI**
1	Contract completed	Contract completed	$105M	$10M	133.2	164.8
2***	$68M	$69M	Not known	Not known	141.7	164.8
3	$30M	Not known	Not known	Not known	Not known	164.8

Notes:- *   PFA is price fluctuation adjustments in the contract
         **   CEWI is the Civil Engineering Works Index and base CEWI at 1980 is 100.0. Current CEWI is taken as that at 1987 4th Quarter which is 164.8
         *** For Contract No. 2, updated estimated cost of works (including estimated PFA of $ M and variation of $1M) = $75M

<u>Equivalent Fee Percentage Calculation</u>

<u>Contract No. 1</u>

Cost of works including price fluctuation adjustments	= $105M
Cost of Works excluding price fluctuation adjustments	= $105M-$10M
	= $95M
Deflated cost of works at 1980	= $95M*100/133.2

<u>Contract No. 2</u>

Updated estimate of Cost of Works (excluding estimated PFA of $ M)	= $75M-$5M
	= $70M
Deflated cost of works at 1980	= $70M*100/141.7
	= $49.4M

Worked example of application of the CEWI remuneration method (Cont'd)

Contract No. 3

Estimated Cost of Works	= $30M	
Deflated cost of works at 1980	= $30M*100/164.8	
	= $18.2M	

For all 3 contracts, total deflated cost of works	= $71.3M + $49.4M + $18.2M	
	= $138.9M	

Based on total deflated cost of works at 1980, consultant fee
may be obtained from the 1980 Scale of Fees at Annex A

Consultant Fee at 1980	= $4,780,550 + 4.3125% * ($138.9M - $100M)
	= $6,458,113

Equivalent fee percentage	= $6,458,113/$138.9M * 100%
	= 4.649%

Consultant Fee Calculations

For all three contracts, assume that the negotiated fee percentage for the design stage is 47% and for the construction stage is 28%.

The estimated completion percentages of each contract are as follows :-

	Contract No. 1	Contract No. 2	Contract No. 3
Design Stage	100%	100%	30%
Construction Stage	100%	40%	0%

Contract No. 1

As stated in para. l(i) above, an adjustment factor of 0.95 is applicable to the Net Cost of Works for calculation of the Design Stage Fee,

Adjusted Cost of Works	= 0.95 * ($105M - $10M)	= $90.25M
Design Stage Fee	= 4.649% * $90.25M * 100% * 47%	= $1,971,990
Construction Stage Fee	= 4.649% * $105M * 100% * 28%	= $1,366,806
Total Fee for interim payment for Contract No. 1		= $3,338,796

Worked example of application of the CEWI remuneration method (Cont'd)

Contract No. 2

Updated estimate of Cost of Works (excluding		= $75M - $5M
estimated PFA of 5M)		= $70M
Design Stage Fee	= 4.649% * $70M * 100% * 47%	= $1,529,521
Construction Stage Fee	= 4.649% * $75M * 40% * 28%	= $ 390,516
Total Fee for interim payment for Contract No. 2		= $1,920,037

Contract No. 3

Estimated Cost of Works	= $30M
Design Stage Fee	= $ 196,653
As the contract has not been tendered,	
Total Fee for interim payment for Contract No. 3	= $ 196,653

The fees calculated above are for interim payments only. When the Final Contract Sum and Price Fluctuation Adjustments (if any) for Contracts No. 2 and 3 are known, the equivalent fee percentage and hence the total consultant fee for all three contracts should be re-calculated in the same manner as shown above and final adjustments to payments to consultants should then be made.

Mathematical Derivation of
Characteristic Factor (CF(T)) for Accepted Tender

Number of tenders received $\qquad$ n

Individual tender price $\qquad$ $p(i); \ i=1,\ldots,n$

Accepted tender price $\qquad$ $p(t)$

Average tender price $\qquad$ $\bar{p} = \dfrac{\sum p(i)}{n}$

Standard deviation $\qquad$ $\sigma = \sqrt{\dfrac{\sum (p(i) - \bar{p})^2}{n}}$

Characteristic factor for accepted tender $\qquad$ $\text{CF(T)} \ = \dfrac{\bar{p} - p(t)}{\sigma}$

Worked Example for Adjusting Uncharacteristically Low Tender

Data

Tender prices for a contract are as follows :-
$41.377 M, $46.257 M, $46.400 M, $48.245 M, $48.312M,
$48.942 M, $49.804 M, $50.350 M, $51.685 M, $52.232M,
$54.081 M

Accepted tender price	$p(t)$	= $41.377 M
Average tender price	$\bar{p}$	= $48.877 M
Standard deviation	σ	= $3.301 M
Characteristic factor of accepted tender	$CF(T)$	$= \dfrac{(\$48.877-\$41.337)M}{\$3.301\ M}$ = 2.284

Procedure

(1) $CF(T) = 2.284 > 1.922$ (Refer to Para. 8(4) of Appendix 5.3)

Therefore, it is an uncharacteristically low tender

i.e. $CF = 1.922$

(2) Adjusted tender price (p)   = Average tender price ($\bar{p}$)

- CF × standard deviation

(σ)

= $(48.877 - 1.922 × 3.301) M

= $42.533 M

(3) Adjusted factor   = $\dfrac{\text{Adjusted tender prices (p)}}{\text{Accepted tender price (p(t))}}$

= $42.533 M/$41.337 M

= 1.029

(4) Adjusted Cost of Works   = Adjustment factor × Cost of Works

= **1.029 × Cost of Works**

Worked Example for Adjusting Uncharacteristically High Tender

Data

Tender prices for a contract are as follows :-

$135.399M, $143.246M, $146.083M, $147.153M, $158.000M, $179.101M, $189.538M

Accepted tender price	$p(t)$	$= \$147.153$ M
Average tender price	$\bar{p}$	$= \$156.931$ M
Standard deviation	σ	$= \$18.594$ M
Characteristic factor of accepted tender	$CF(T)$	$= \dfrac{(\$156.931 - \$147.153)M}{\$18.594 \text{ M}}$
		$= 0.526$

Procedure

(1) $CF(T) = 0.526 < 0.612$ (Refer to Para. 8(5) of Appendix 5.3)

Therefore, it is an uncharacteristically high tender

i.e. $CF = 0.612$

(2)   Adjusted tender price (p) $=$ Average tender price ($\bar{p}$)

$- CF \times$ standard deviation (σ)

$= \$(156.931 - 0.612 \times 18.594)$ M

$= \$145.522$ M

(3)   Adjusted factor $= \dfrac{\text{Adjusted tender prices (p)}}{\text{Accepted tender price (p(t))}}$

$= \$145.522 \text{ M}/\$147.153 \text{ M}$

$= 0.989$

(4)   Adjusted Cost of Works $=$ Adjustment factor $\times$ Cost of Works

$= \mathbf{0.989 \times Cost\ of\ Works}$