



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**E.171**

**TELEPHONE NETWORK AND ISDN**

**OPERATION, NUMBERING, ROUTING AND MOBILE  
SERVICE**

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**INTERNATIONAL TELEPHONE ROUTING  
PLAN**

**ITU-T Recommendation E.171**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation E.171 was published in Fascicle II.2 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

## **Recommendation E.171**

### **INTERNATIONAL TELEPHONE ROUTING PLAN**

#### **1 Introduction**

1.1 This plan describes an international telephone routing plan designed to enable Administrations to select routings for their traffic which will result in a satisfactory connection between any two telephone stations in the world. The Plan relates to automatic and semi-automatic telephone traffic from fixed and mobile (both land and maritime) stations. The Plan is necessary to allow the objective to be achieved with maximum economy by the most efficient use of costly circuits and switching centres while safeguarding the grade of service and quality of transmission.

1.2 The Plan is one of the basic CCITT Recommendations which influence many other Recommendations, for example the transmission plan (Recommendation G.101).

1.3 In practice the large majority of international telephone traffic is routed on direct circuits (i.e., no intermediate switching point) between International Switching Centres (ISCs). It should be noted that it is the rules governing the routing of connections consisting of a number of circuits in tandem that this Recommendation primarily addresses. These connections have an importance in the network because:

- they are used as alternate routes to carry overflow traffic in busy periods to increase network efficiency,
- they can provide a degree of service protection in the event of failures of other routes,
- they can facilitate network management when associated with ISCs having temporary alternative routing capabilities.

1.4 This Plan replaces the previous one established in 1964 and it can be applied to all existing switching equipment and signalling systems and is intended to be flexible enough to incorporate new switching and signalling developments.

Nevertheless, it is recognized that the Plan, which is complementary to the plan contained in Recommendation E.172, will have to be reviewed and revised to take account of developments in telecommunications.

1.5 The Plan accomplishes its basic purposes unconstrained by, and requiring no changes to, the numbering plan, the rules for charging the calling subscriber and the rules for the apportionment of charges (international accounting).

#### **2 Principles**

2.1 The Plan preserves the freedom of Administrations:

- a) to route their originating traffic directly or via any transit Administration they choose;
- b) to offer transit capabilities to as wide a range of destinations as possible in accordance with the guidelines which it provides.

2.2 The Plan provides guidance on possible international routings. Any routing chosen must be subject to agreements between the Administrations involved before implementation.

The freedom of Administrations to choose the routing of their terminal and transit traffic may be limited by technical, commercial and administrative considerations including:

- the capability of precisely measuring traffic volumes for accounting purposes,
- the need to maximize route profitability,
- the desirability of simplicity in international accounting.

2.3 The governing features of this Plan are:

- a) it is not hierarchical;
- b) Administrations are free to offer whatever transit capabilities they wish, providing they conform to this Recommendation;
- c) direct traffic should be routed over final (fully provided) or high usage circuit groups;

- d) no more than 4 international circuits in tandem should be involved between the originating and terminating ISCs;
- e) advantage should be taken of the non-coincidence of international traffic by the use of alternative routings to effect circuit economies and provide route diversity (Recommendation E.523);
- f) the routing of transit switched traffic should be planned to avoid the possibility of circular routings;
- g) when a circuit group has both terrestrial and satellite circuits the choice of routing should be governed by:
  - the guidance given in Recommendation G.114,
  - the number of satellite circuits likely to be utilized in the overall connection,
  - the circuit which provides the better transmission and overall service quality<sup>1)</sup>.
- h) the inclusion of two or more satellite circuits in the same connection should be avoided in all but exceptional cases. Annex A contains details on the effects of satellite communications.  
Recommendation Q.14 defines the means to control the number of satellite links in an international telephone connection;
- i) both originating and transit traffic should be routed over the minimum number of international circuits in tandem unless this is in conflict with one of the above-mentioned features.

### **3 Number of circuits in tandem**

#### *3.1 International circuits*

For reasons of transmission quality as well as the minimization of post-dialling and answer signal delays and the avoidance of signalling time-outs, it is desirable to limit the number of circuits in tandem in an overall connection (Recommendations G.101 and G.114, § 1). Recommendation Q.7 gives signalling considerations on tandem routings.

In this Plan the number of international circuits in a connection is limited to a maximum of 4. (See § 3.3.2 for a special case with multiple ISCs within the area of one Administration.)

#### *3.2 National circuits*

Limitations in the national section of the international connection are given in Recommendation G.101, § 3.1.

Many Administrations have fulfilled the requirements of Recommendation G.101, § 3.1 by establishing a national routing plan based on a theoretical final route structure with low-loss-probability circuit groups between switching centres of different categories.

The actual structure in many cases involves direct routes which bypass the theoretical final route or part of it, the structure being rather similar to the former international routing plan.

*Note* – The former international routing plan was last published in the Orange Book, Volume II.2, Recommendation E.171.

#### *3.3 Multiple ISCs in a country*

##### *3.3.1 In the originating or terminating country*

Administrations may find it advantageous for technical or economic reasons, or for the protection of service, to use multiple originating and/or terminating ISCs. In some cases, this could result in a routing for a call which includes a circuit between two ISCs in the originating or terminating country. Such circuits may be regarded as national circuits in applying this Plan, and as such should be included in the national link allocation, see Recommendation E.172.

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<sup>1)</sup> When there are circuits between ISCs using different geographical routes with different transmission means, preference should be given to those circuits which provide better transmission quality as long as this is not conflicting with any other part of this Recommendation.

### 3.3.2 *In a transit country*

Some Administrations may find it desirable to route transit traffic between two ISCs in their own country. In this case the allowable number of international circuits in tandem may be increased from 4 to 5 (this is the only exception to § 3.1 above).

## **4 Routing techniques**

With advanced SPC exchanges and enhanced signalling systems new routing techniques are emerging (see Recommendation E.170). These techniques can be used nationally as found necessary by individual Administrations or bilaterally between Administrations.

## **5 Basic routing rules**

### 5.1 *Originating traffic*

5.1.1 Originating traffic at an ISC may be offered to any route, taking into account all factors in this Plan, and the following guiding principles, to ensure good overall service quality for the call connection:

- a) an originating ISC should first select the direct route to the destination, if it is available;
- b) if the direct route is unavailable (because all circuits are busy or because no direct route is provided) then the originating ISC may select the route to any transit ISC which conforms to the principles in § 4.2 below. An agreement should first be reached between the originating, terminating and transit Administrations involved, for the use of this transit route.

5.1.2 A circuit group may be designed as a high usage circuit group (see Recommendation E.522) or as a final circuit group (see Recommendations E.520 or E.521).

5.1.3 Examples of some possible routings are given in Annex B.

### 5.2 *Transit traffic*

#### 5.2.1 *Two and three international circuits in tandem*

An Administration offering transit capabilities may do so without special arrangements or restrictions to all destinations served by:

- a) direct circuit groups, or
- b) switching via an additional transit ISC that has a direct final circuit group to the destination, or
- c) a combination of a) and b).

Examples of two and three international circuits in tandem are given in b) to e) of Figure B-1/E.171.

#### 5.2.2 *Four international circuits in tandem*

If an Administration has provided a routing for its originating traffic that involves a maximum of 3 international circuits in tandem to a destination, it may offer this capability to other Administrations for transit traffic. In this case, these other Administrations must not themselves offer transit capabilities to the same destination as this would exceed 4 international circuits in tandem.

Examples of 4 international circuits in tandem are given in f) and g) of Figure B-1/E.171.

5.2.3 A circuit group may be designed as a high usage circuit group (see Recommendation E.522) or as a final circuit group (see Recommendations E.520 or E.521).

#### 5.2.4 *Special arrangements*

Some Administrations may route transit traffic differently from their own originating traffic to a given destination. These routings will in some cases involve offering transit traffic to direct routes, but not to overflow routes via alternative transit ISCs. On the other hand, originating traffic offered to the same direct routes is given access to overflow routes.

This arrangement may be used for:

- a) limiting the number of international circuits in tandem for transit calls, yet allowing originating calls up to the maximum of 4 international circuits in tandem.
- b) preventing transit traffic from overflowing from direct routes, to minimize subsequent transit charges.
- c) minimizing transmission propagation delay for transit calls.

In such cases, care must be exercised to avoid grade of service problems. Consideration should be given to:

- i) the analysis of 24-hour traffic profiles;
- ii) the exchange of network status information between Administrations.

In implementing such arrangements, Administrations offering transit capability should provide the necessary information on traffic profiles and network status capabilities. Originating Administrations should evaluate such information taking into account transmission costs, and call completion factors. (See Recommendations E.522 and E.523.)

Examples of some routings involving special arrangements are given in a) and b) of Figure B-2/E.171.

## **6 List of international transit capabilities**

6.1 To aid in the application of transit routings, a list of international transit capabilities via an Administration is desirable.

6.2 Each Administration that wishes to offer transit capabilities should develop and distribute its own list.

6.3 Annex C details the essential information that should be contained in a list of international transit capabilities plus additional information that might also be distributed by Administrations offering transit capabilities or might be requested by Administrations seeking transit routings.

## ANNEX A

(to Recommendation E.171)

### **The effects of satellite communication**

A.1 The use of geostationary satellite circuits does not call for any alteration in the basic principles and rules of this Plan. However, because of the mean propagation time on satellite circuits, the precautions specified in Recommendation G.114 must be observed.

A.2 At originating ISCs, calls which are to be transit switched at another ISC and likely to use a satellite circuit elsewhere in the connection should be routed using terrestrial circuits from the originating ISC, if available.

A.3 At ISCs arrangements should be made to guard against the inclusion of two or more satellite circuits in the same connection in all but exceptional cases. (See § A.6 below.)

Avoidance of two or more satellite circuits is made more feasible when the signalling systems used have signals indicating whether the connection already includes a satellite circuit. (See Recommendation Q.7.)

In those cases when the signalling system does not provide the necessary information, bilateral agreement should be sought between the Administrations involved to establish a special circuit group on which traffic can be routed that has already one or more satellite circuits in the connections. (See Figure A-1/E.171.)

A.4 The use of national satellite circuits for international originating and terminating connections should be avoided to the extent possible.

A.5 Connections (originating, terminating or transit) to and from the international maritime mobile satellite service should not, so far as possible, comprise other satellite circuits. In the shore-to-ship direction the country codes allocated to the maritime mobile satellite service should be analysed in order to apply this provision.

A.6 There will be cases when the above provisions cannot be fully applied. These are:

- a) routing to and from Administrations with exclusive or almost exclusive use of satellite circuits for international service;
- b) routings containing more than one international circuit in tandem in which the signalling systems used on one or more of the circuits in the connection does not provide nature of circuit indicators, or when no agreement can be reached with respect to the special circuit group;
- c) when no other reliable means of communication is available; then two or more satellite circuits in one connection may be used.

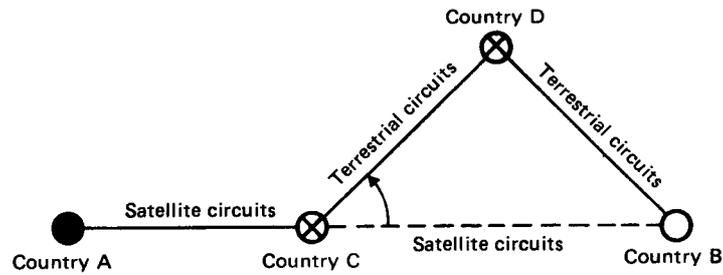
*Note* – When it is unavoidable to use more than one satellite circuit in an international connection, attention to echo control as indicated in Notes 2 and 3 of Recommendation G.114 should be exercised.

A.7 Control methods for echo suppressors<sup>2)</sup> are given in Recommendation Q.115.

A.8 The use of demand assigned satellite systems in international telephony (e.g., SPADE) is governed by the same general and special considerations given above. The entirety of a demand assigned system and its access circuits may be regarded as a single international circuit for transmission purposes and as a transit ISC for routing purposes.

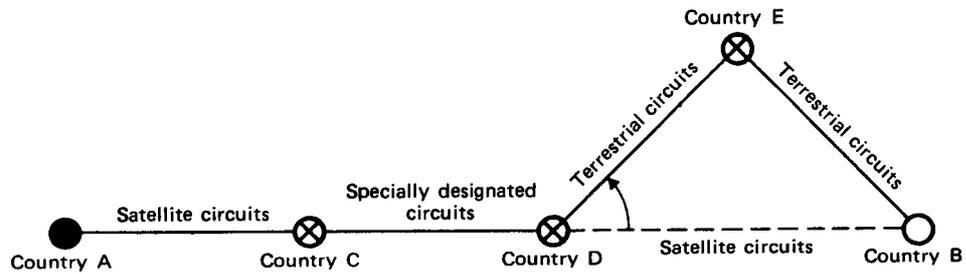
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<sup>2)</sup> Echo cancellers are also now in use.



*Note* – Circuit group Country C to Country B is high usage for traffic originating at C but is not accessed for transit traffic from circuit group Country A to Country C in order to avoid two international satellite circuits in tandem.

a)



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*Note* – Circuit group Country C to Country D is specially designated by the Administration involved to be treated as if it comprised satellite circuits. Circuit group Country D to Country B is high usage for traffic originating at D but is not accessed for transit traffic from the specially designated circuit group Country C to Country D.

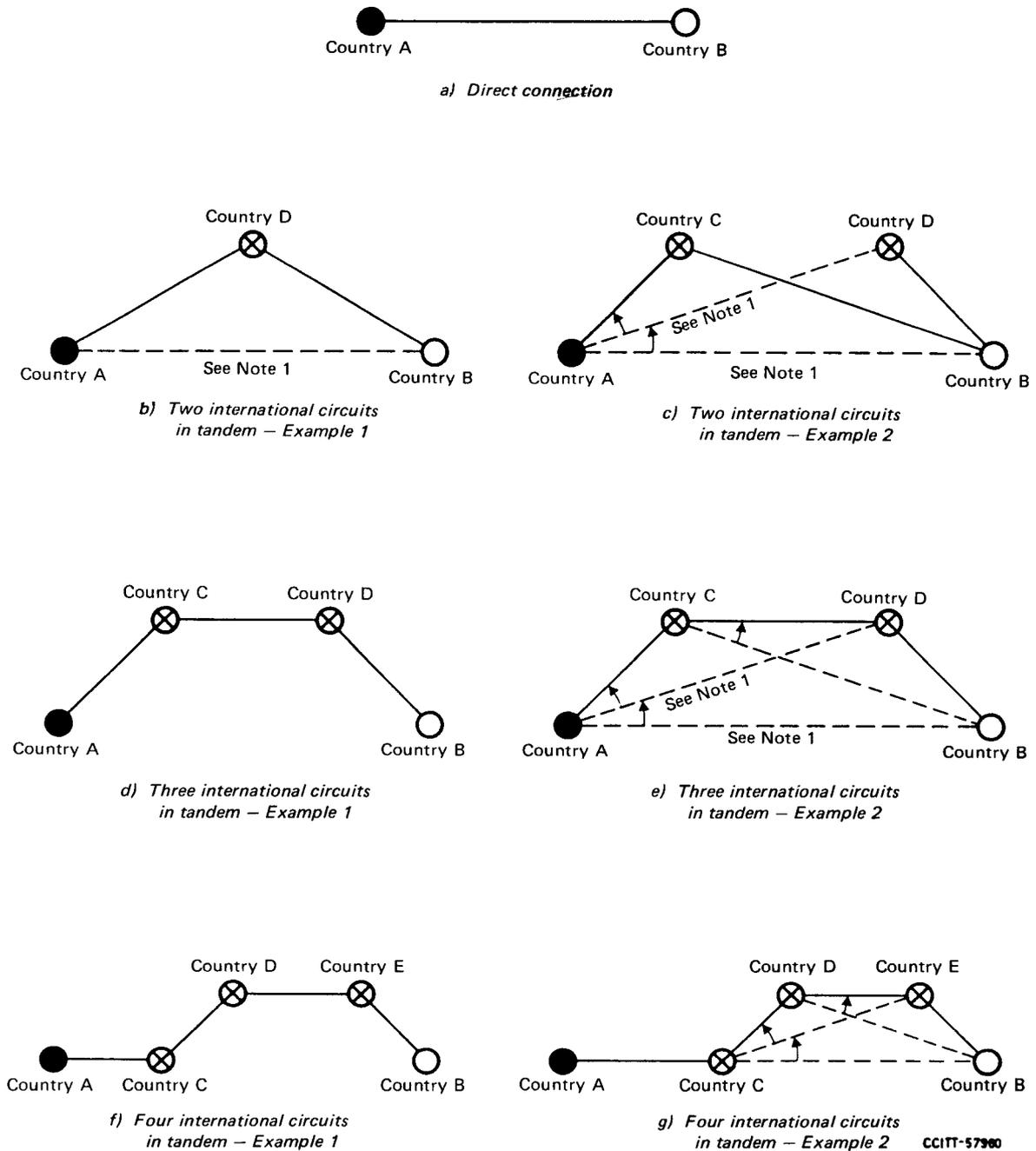
b)

FIGURE A-1/E.171

ANNEX B

(to Recommendation E.171)

Examples of possible routings and special arrangements



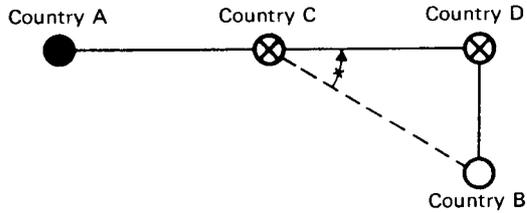
*Note 1* – These circuit groups illustrate the choices available to the originating Administration under § 5.1.

*Note 2* – For explanation of legends, see Figure B-2/E.171.

*Note 3* – For Figure a) see § 5.1.1 a); for Figures b), c), d), e) see §§ 5.1.1, 5.2.1 b) and 5.2.1 c); for Figures f), g) see §§ 5.1.1 and 5.2.2.

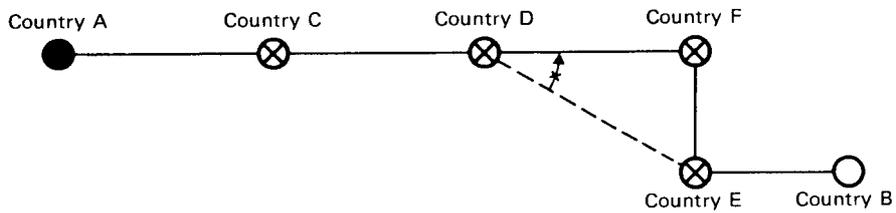
FIGURE B-1/E.171

Example of some routings possible under the International Telephone Routing Plan



*Note* – Country C routes its originating traffic to Country B via a direct route with overflow to an alternative route via a transit ISC in Country D. In order to minimize transit charges Country C may bar overflow from the direct route for transit traffic. In establishing this arrangement for Country A, Countries C and A should review the traffic levels and 24 hour profiles to ensure that the transit traffic experiences adequate grade of service.

a)



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*Note* – This example uses the same principle as a) for the purpose of limiting the number of circuits in tandem for transit traffic to 4. This arrangement may be applied at any of the transit ISCs.

b)

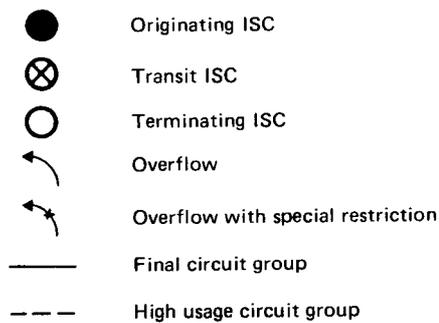


FIGURE B-2/E.171

Examples of some special arrangements (see § 5.2.4)

ANNEX C

(to Recommendation E.171)  
**List of international transit capabilities**

C.1 *Essential information on international transit capabilities*

C.1.1 *Use*

Every Administration offering transit capabilities should compile and distribute a list including at least the information shown below in order to enable other Administrations to make a first choice of possible transit routings.

C.1.2 *Suggested format*

See Figure C-1/E.171.

Administration \_\_\_\_\_ Date \_\_\_\_\_

Address for inquiries \_\_\_\_\_

\_\_\_\_\_

Destination	Transit ISC	Route type	Terrestrial possible	Special restrictions

FIGURE C-1/E.171

C.1.3 *Instructions for completing the list*

*Item A – Administration or RPOA*

Enter the name of the Administration or recognized private operating agency responsible for preparing this list.

*Item B – Date of Information*

Enter the date for which the information below applies.

*Item C – Address for Inquiries*

Enter the name, address, telex and telephone number of the organizational unit or individual who will respond to enquiries concerning transit capabilities.

*Column 1 – Destination country or Administration*

Enter the name of the destination country or Administration. These destinations should be listed alphabetically within each World Zone grouping. Only those destinations for which this ISC can carry automatic transit traffic should be listed in this column. All destinations for which transit capabilities are being offered should be listed.

*Column 2 – Transit ISCs*

Enter the name or location that identifies the international switching centre(s) that has automatic transit access to the destinations in column 1. For multiple transit ISCs within the same Administration list each ISC in sequence.

#### *Column 3 – Route Type*

Enter whether the transit route to the destination is either:

DIR – If “direct” to the terminating ISC.

IND – If “indirectly” first routed via a further transit ISC. The name of the further transit ISC should also be entered.

ALT – If either the “DIR” or “IND” route automatically overflows to an “alternative” transit ISC. The name of the alternative transit ISC should also be entered.

#### *Column 4 – Terrestrial possible*

Enter YES if at least some transit calls to this destination can obtain an all terrestrial route beyond the transit ISC.

Enter NO if all transit calls to this destination will use a satellite circuit in the route beyond the transit ISC.

#### *Column 5 – Special restrictions*

Enter YES if the transit traffic is subject to overflow restrictions (see § 5.2.4) that might affect the grade of service achieved.

Enter NO if no such restrictions apply.

### *C.2 Additional information on international transit capabilities*

#### *C.2.1 Use*

The information shown below is of value in comparing and selecting possible transit routes. Administrations offering transit capabilities might choose to compile and distribute some or all of these items with their basic list of international transit capabilities. Alternatively Administrations selecting a transit route may use the items shown below as a basis for enquiries.

#### *C.2.2 Format*

No particular format is suggested for this information. However, it is recommended that both transit and originating Administrations use the terminology and definitions given below.

If changes are planned in any of the items the change should be indicated together with the effective date.

#### *C.2.3 Details of additional items*

##### *Traffic profile*

Under this item the busy hour traffic on the circuit group used beyond the transit ISC should be given together with an indication of the traffic variations during the day. Preferably the variations should be presented in the form of hourly traffic distributions as shown in Recommendation E.523.

##### *Transit charges*

Under this item details of the applicable transit charges should be given.

##### *Grade of service*

The grade of service normally experienced to the destination should be given. This may be supplemented by time of day variations. If overflow restrictions for transit traffic apply, the information must include at least the hours during which the grade of service is 1% or better.

##### *Circuit quantities*

The total circuit quantities available and subtotals for each type of transmission medium should be given.

If indirect routing is used this information should be given for the circuit groups to the next transit ISC.

##### *Signalling*

The signalling systems used for the onward routing from the transit ISC should be listed.

*Restoration*

This item should outline the restoration policy in the case of a major transmission facility outage in the onward routing.

*Echo Control*

This item should list the echo control capabilities at the transit ISC.

*Prevention of two or more satellite circuits in tandem*

This item should explain the capabilities at the transit ISC for preventing the connection of two satellite circuits in tandem.

Where indirect routing is used, this item should also identify whether a specially designated circuit group has been agreed to allow prevention of two satellite circuits in the same connection at a subsequent ISC.