

**STANDARD TERMS FOR THE CO-LOCATION ON  
CELLULAR MOBILE TRANSMISSION SITES  
SERVICE**

**SCHEDULE 5  
CO-LOCATION ON CELLULAR MOBILE  
TRANSMISSION SITES INTERFERENCE  
MANAGEMENT AND DESIGN  
PUBLIC VERSION**

**28 April 2008**

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## 1 Introduction

- 1.1 This Co-location on Cellular Mobile Transmission Sites Interference Management and Design document (**Interference Management and Design document**) forms part of the Mobile Co-location Terms. This Interference Management and Design document sets out the procedures for managing Interference in relation to the Mobile Co-location Service.

## 2 Definitions and Interpretation

- 2.1 References to clauses are references to clauses in this Interference Management and Design document unless expressly stated otherwise. The definitions set out in the Mobile Co-location General Terms and the Mobile Co-location Operations Manual apply to the extent that they are not expressly modified by or inconsistent with the context of this Interference Management and Design document. This Interference Management and Design document should be interpreted in conjunction with the Mobile Co-location Service Operations Manual.

- 2.2 **Definitions.** For the purposes of this Interference Management and Design document, the following definitions apply:

<b>Access Provider's Forecast</b>	has the meaning set out in clause 9.2.
<b>Agreed Standard Solution</b>	has the meaning set out in clauses 10.1.9(a) and 10.1.13(a).
<b>dB</b>	means decibels.
<b>Design Principles</b>	means those principles set out in section 7.
<b>Desktop Analysis Meeting</b>	has the meaning set out in clause 10.1.7
<b>Disagreed Solution</b>	has the meaning set out in clauses 10.1.9(b) and 10.1.13(b).
<b>EIRP</b>	means effective isotropic radiated power.
<b>Existing Co-locator</b>	means any other Access Seeker and any other third party who have installed and operate equipment on or with the Relevant Facilities.
<b>Interference</b>	means the unwanted effect of radio waves owing to one or more emissions, radiations or inductions, or any combination of one or more of those things, on the reception of radiocommunications.
<b>Isolation</b>	means the loss between the Antenna port of the Access Seeker's transmitting base station and the Antenna port of the Access Provider's receiving base station.

<b>ITU</b>	means the International Telecommunications Union.
<b>Link Budget</b>	means a calculation of power and noise levels between the transmitter and receiver (uplink or downlink) in a Cellular Mobile Telephone Network. A Link Budget takes account of all gain and loss factors to yield operating values of Signal to Noise Ratio (SNR) and/or Bit Error Rate (BER). A Link Budget accounts for attenuation of the transmitted signals due to propagation; antenna gains; cable, connector, device and miscellaneous losses.
<b>Maximum Configuration</b>	has the meaning set out in clause 10.3.12.
<b>Non-Compliant Solution</b>	has the meaning set out in clause 10.1.13(c) and 10.5.2.
<b>Performance Degradation</b>	has the meaning set out in clause 6.1.1.
<b>Regulations</b>	has the meaning set out in clause 3.1.
<b>RF</b>	means radio frequency.
<b>Testing Procedures Meeting</b>	has the meaning set out in clause 10.1.10.
<b>Unacceptable Performance Degradation</b>	has the meaning set out in clause 6.2.

### 3 Radiocommunications Act 1989

- 3.1 The Radiocommunications Act 1989 and Radiocommunications Regulations 2001 (together, the **Regulations**) provide for the management of radio frequency spectrum, and include provisions in relation to interference to receivers.
- 3.2 The Regulations do not provide for the way in which Interference should be managed where such Interference arises out of mobile co-location where equipment is transmitting within its licence terms. Such Interference may disrupt or degrade the performance of Telecommunications Services provided to Customers or End Users but the Regulations do not provide for dealing with this Interference.
- 3.3 This Interference Management and Design document therefore sets out how the Access Seeker and the Access Provider will manage Interference, specifically in relation to the Mobile Co-location Service.

### 4 Scope

- 4.1 This Interference Management and Design document sets out the following:
- 4.1.1 the objectives of managing Interference in relation to the Mobile Co-location Service;

- 4.1.2 the levels of Unacceptable Performance Degradation in relation to the Mobile Co-location Service;
- 4.1.3 Design Principles to avoid Unacceptable Performance Degradation; and
- 4.1.4 Procedures for Interference management in co-location.

## 5 Objectives

### 5.1 General Overview

- 5.1.1 Telecommunications Services which utilise RF can cause Interference to each other but the risk of Interference occurring can be reduced if providers of such Telecommunications Services have in place, and abide by, design principles and testing protocols.
- 5.1.2 This Interference Management and Design document sets out some recommended design principles and testing protocols and the requirements which must be met by an Access Seeker as part of the Mobile Co-location Service.

### 5.2 Specific Objectives

- 5.2.1 The objectives of this Interference Management and Design document are to:
  - (a) set out how Interference issues which arise with respect to the Mobile Co-location Service can be resolved in a timely manner;
  - (b) set out efficient solutions to maximise the use of physical resources as part of the Mobile Co-location Service;
  - (c) ensure that disruption and degradation of Telecommunications Services to Customers and to End Users is minimised;
  - (d) reflect the principle that Access Seekers shall not implement solutions which will, or could, degrade the performance or standard of existing Telecommunications Services to Customers or End Users;
  - (e) reduce the risk of Interference arising between the co-located equipment in relation to the provision and receipt of the Mobile Co-location Service;
  - (f) set out a way in which provision is made for new and evolving Telecommunications Services and technologies, so that Customers and End Users may benefit from technology advances; and
  - (g) promote the long term interests of End Users and the efficiency of the New Zealand communications industry.

## 6 Unacceptable Performance Degradation

### 6.1 Performance Degradation

- 6.1.1 Performance degradation in relation to the Mobile Co-location Service is a reduction in the quality of the level of Telecommunications Service provided by the Access Provider and includes, but is not limited to, a rise in noise floor, loss of system gain, and losses suffered from electrical or physical causes (**Performance Degradation**).
- 6.1.2 Performance Degradation may affect Customers and/or End Users, for example, without limitation, through an increase in the number of dropped calls; call set-up failures; reduced call quality; reduced throughput; outage-time; and/or a reduction in or loss of Telecommunications Services.
- 6.1.3 Performance Degradation may be observed by Telecommunications Service providers through Customer complaints and/or statistical performance data including, without limitation, traffic volume; drop call rate; call setup failure rate; handover failure rate; quality (such as bit error and block error rates); attach failure rate; PDP activations failure rate; throughput reduction or failure; location update failure rate; IMSI update failure rate; and paging failure rate.

### 6.2 Unacceptable Performance Degradation

- 6.2.1 "Unacceptable Performance Degradation" in this Interference Management and Design document means any one or more of the following:
- (a) Isolation of less than 30 dB between the Antenna port of the Access Seeker's transmitting equipment and the Antenna port of the Access Provider's receiving equipment;
  - (b) a total level of loss from the Access Provider's Link Budget of more than 0.5 dB in either the uplink budget or the downlink budget;
  - (c) Performance Degradation which affects the quality of Telecommunications Services in more than a minor way.
- 6.2.2 The Performance Degradation in clause 6.2.1(c) above may occur even if the Isolation level in clause 6.2.1(a) is met and the Link Budget loss in clause 6.2.1(b) is not exceeded.

## 7 Design Principles

- 7.1 The following clauses set out the co-location design principles .

## 7.2 Isolation

7.2.1 This section of the Interference Management and Design document sets out the design principles for how Isolation between the Access Seeker Equipment and the Access Provider Equipment may be achieved and managed.

7.2.2 Generally, Isolation can be achieved by various means including, without limitation:

- (a) the separation of frequency bands;
- (b) the physical horizontal and/or vertical separation of Antennas. Refer to Figure 5A for examples of vertical and horizontal separation with the same Antenna orientation;

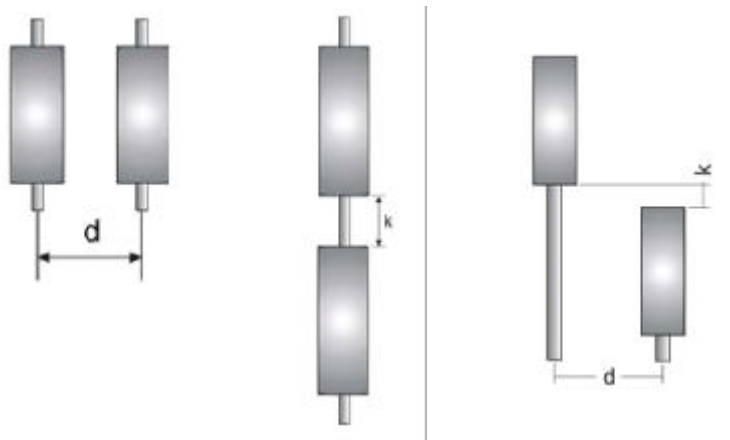


Figure 5A: Example of vertical and horizontal separation with same Antenna orientation

- (c) the arrangement of Antenna in such a way so as to minimise the Interference between affecting and affected equipment. This can be achieved by the alignment of Antenna azimuths in such a way so as to avoid the overlap of beamwidths in the near field. Refer to Figure 5B for examples of horizontal separation with different Antenna orientation;

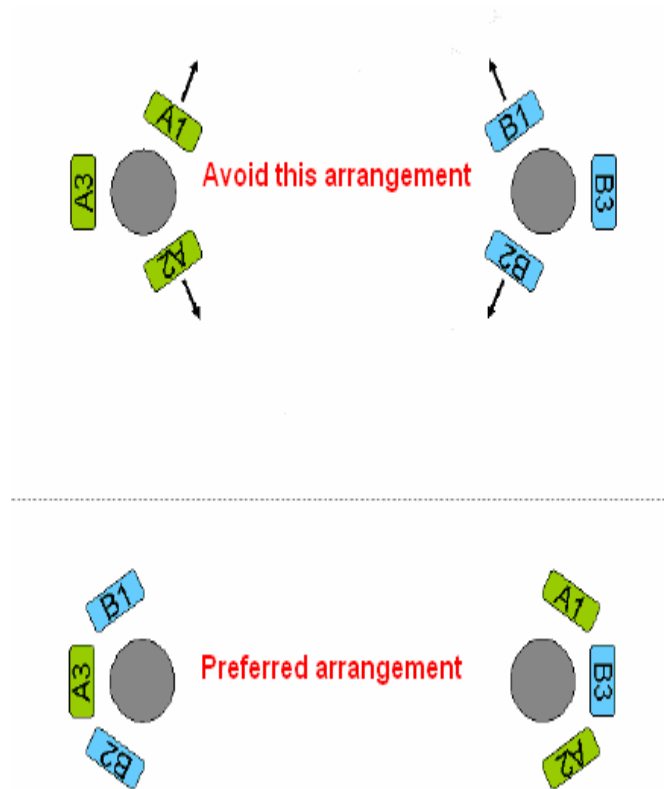


Figure 5B: Example of horizontal separation with different Antenna orientation

- (d) the selection of Antenna gain, size and beamwidth to decrease the Interference;
- (e) the use of filters to prevent:
  - (i) receiver blocking. Blocking in this sense means desensitisation of equipment which contributes to Performance Degradation;
  - (ii) spurious emissions. Spurious emissions in this sense means unwanted transmitter power; and
  - (iii) intermodulation. Intermodulation in this sense means the result of two or more forming additional signals that cause interference;
- (f) the use of shielding, by physical blocking; and
- (g) the attenuation (reduction) of transmit power levels of the Access Seeker Equipment.

### 7.3 Isolation Drivers

7.3.1 Factors which drive the need for Isolation include, without limitation:

- (a) the level of net interference energy, which has several components including, without limitation, the energy resulting from:
- Adjacent Channel Selectivity (ACS) (as described in Report ITU-R M.2031) of the interfered receiver system;
  - Adjacent Channel Leakage Ratio (ACLR) (as described in Report ITU-R M.2031) of the interfering transmitter system; and
  - Intermodulation of one or more transmitters interfering with the receiver system.
- (b) the degree to which equipment will not deliver ideal performance, for example, due to the aging of equipment.

7.3.2 The consequences of these factors on Isolation are influenced by, without limitation:

- (a) the transmitter power levels and modulation of the Access Seeker Equipment;
- (b) the susceptibility of the receiver to net interference energy; and
- (c) the inter-system Isolation between transmitters and receivers, for base station and cellular mobile equipment.

#### 7.4 Antenna Separation

7.4.1 The physical separation of Antennas is a common way in which Isolation can be achieved. Clauses 7.4.2 – 7.4.4 set out various other ways to achieve Isolation.

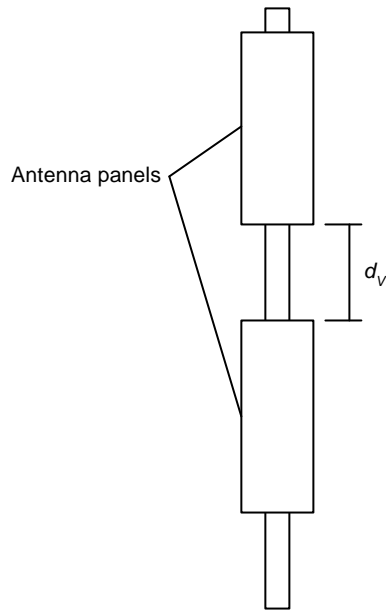
7.4.2 The distance required for the physical separation of Antennas used for the Mobile Co-location Service cannot be easily deduced by calculation because the co-located Antennas are in the “near field” rather than the “far field”. Therefore, the following formulas provide an indicative-only physical separation distance for a given Isolation value. Field measurements can be used to confirm the calculated values. For these reasons, Isolation needs to be verified on a Site-by-Site basis.

7.4.3 “Vertical Separation Distance” can be calculated approximately from the general formula:

$$\text{Isolation: } A_V \approx 28 + 40 \log (d_V / I) \quad [\text{dB}]$$

where  $d_V$  = vertical tip-to-tip distance between Antennas [m]

$I$  = wavelength [m]



7.4.4 "Horizontal Separation Distance" can be calculated approximately from the general formula:

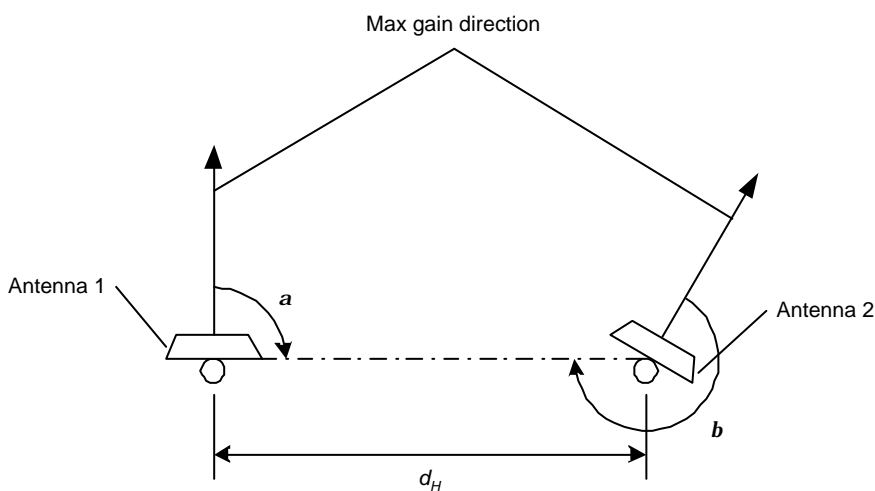
Isolation:  $A_H \approx 22 + 20 \log (d_H / \lambda) - (G_1(a) + G_2(b))$  [dB]

where  $d_H$  = horizontal distance between the centrelines of Antennas [m]

$\lambda$  = wavelength [m]

$G_1(a)$  = gain of Antenna 1 [dBi] at the relative angle,  $a$ , to Antenna 2

$G_2(b)$  = gain of Antenna 2 [dBi] at the relative angle,  $b$ , to Antenna 1



7.4.5 In addition to the Isolation between the Access Seeker Equipment and Access Provider Equipment, the following design considerations should be taken into account by the Access Seeker when designing the Antenna separation distances :

- (a) new Antennas should not unacceptably degrade the performance of other Antennas;
- (b) the physical blockage of Antennas is to be avoided;
- (c) Antenna separation shall allow for adequate space for the installation of Antenna ancillaries including, without limitation, remote electrical tilts, mast head amplifiers and feeders. Such Antenna ancillaries must occupy the space efficiently;
- (d) new Antenna beam azimuths shall not cross existing Antenna beam azimuths;
- (e) access to the Antennas and their ancillaries for the purpose of maintenance should always be allowed; and
- (f) the maintenance of Antennas and their ancillaries shall be carried out in such a way as to minimise outages to the other Party and any other third parties.

## 7.5 Co-location issues

7.5.1 When, even with the use of Mast replacement, extension or revision (as referred to in section 21 of the Mobile Co-location Operations Manual), Relevant Facilities cannot be used for mobile co-location only then may the Access Seeker request that the Access Provider move, add, decrease or change in any way the Access Provider Equipment.

7.5.2 Any proposal from the Access Seeker which requests the Access Provider to move, add, decrease or change in any way the Access Provider Equipment must not result or risk resulting in:

- (a) Unacceptable Performance Degradation;
- (b) unreasonable technical or operational practicability having regard to the Access Provider's Network;
- (c) a loss or reduction in Network security and/or safety;
- (d) the Access Provider not being able to meet its existing legal duties to provide a defined level of service to Customers or End Users;
- (e) an inability, or likely inability, of the Access Seeker to comply with any reasonable conditions on which the Mobile Co-location Service is supplied;
- (f) the Access Provider's current and reasonable forecast requirements for capacity (as set out in section 9) on the Relevant Facilities not being met;
- (g) any relevant requirements under the Resource Management Act 1991, the Building Act 2004 and/or any relevant District or Regional Plan not being met;

- (h) any relevant health and safety requirements under any enactment not being met;
- (i) any existing contractual obligations to third parties, including lessors of land on which the Relevant Facilities are located not being met; and
- (j) the interests of third parties who use the Relevant Facilities not being taken into account.

7.5.3 In the event of such a request the Access Seeker shall provide to the Access Provider all relevant information in relation to its proposal, including the following:

- (a) all relevant technical and design specifications, dimensions, load factors and the radiocommunications characteristics of the Access Seeker Equipment;
- (b) a construction timetable and work plan for the works; and
- (c) anything else reasonably required by the Access Provider.

7.5.4 In the event that such a request is accepted by the Access Provider, the Access Seeker shall pay all costs associated with the request and its implementation. The Access Provider's consideration and involvement in the implementation of such a request shall be charged for by the Access Provider in accordance with the Charges, as agreed between the Parties pursuant to the Mobile Co-location General Terms.

## **8 Measurement and Testing**

### **8.1 Procedure for Measurement and Testing**

8.1.1 This section sets out the requirements for measurement and testing for Interference and Unacceptable Performance Degradation and suggests some ways in which testing and measuring may be done.

8.1.2 Measurement and testing shall be designed, implemented and performed on each of the Relevant Facilities where Access Seeker Equipment is installed in order to assess whether Unacceptable Performance Degradation is occurring. Measurement and testing shall be undertaken by the Access Seeker with the support of the Access Provider as required.

8.1.3 The objective of performing such measurement and testing is to confirm that there is a low risk of any Unacceptable Performance Degradation occurring and enable any identified Interference to be minimised.

8.1.4 The Parties should share the results of such measurements and testing and attempt to align and agree the results.

8.1.5 The following are two separate approaches that contain examples of tests that may be undertaken:

- (a) the Parties may test for Isolation to determine the likely “worst case” Interference mechanisms based on Antenna arrangements and/or Access Seeker Equipment configurations. For the worst case configuration(s) of the Access Seeker Equipment, the Parties will test the following elements at Maximum Configuration (the configuration requested in the Access Seeker’s co-location application) and at full power with a normal mix of traffic modulations and bursting (or using simulations):
- (i) Measure the receiver sensitivity degradation and/or noise rise and/or blocking and/or other losses on the Access Provider Equipment. This can be due to spurious emissions and intermodulation arising from the Access Seeker Equipment. The following are examples of tests which may be undertaken to measure Link Budget loss:
- sweep the entire receive band of the Access Provider Equipment with a low noise spectrum analyser then tune the receiver to the band where effects are found to assess the Interference (e.g. loss of receive sensitivity and/or noise rise) when the Access Provider Equipment is transmitting. This test should be done for all the Access Seeker transmitter systems and bands versus Access Provider receiver systems and bands in the worst case Antenna arrangement.
  - Operate (or simulate) weak wanted signal (weak mobile for base station receive case). Observe indications of performance degradation (e.g. BER, noise rise, VQI), tune the receiver through the receive band to observe effects).
- (ii) Measure the Isolation between the Access Provider and Access Seeker co-located Antennas in the worst case Antenna arrangement. These tests should be done for all the Access Seeker transmit systems and bands versus Access Provider receiver systems and bands in the worst case Antenna arrangement. The following test is an example of tests that may be undertaken to measure isolation:
- Transmit a CW sweeping signal from the Antenna port of the Access Seeker Equipment and receive the CW sweeping signal on the Antenna port of the Access Provider Equipment. This must be performed over the Access Seeker’s transmit band and the Access Provider’s receive band.

- (b) The Parties may carry out a full test to determine the possible Interference mechanisms. This would involve exhaustive testing to attempt to minimise the possibility of Unacceptable Performance Degradation occurring as follows:
- Test all systems on the Relevant, one to the other;
  - Test all carriers on all cells, one to the other (exhaustive);
  - Test the full range of Antenna arrangements and equipment configurations;
  - Test (a) for the above (3) test cases at the maximum configuration of the Access Seeker Equipment and full power with normal mix of traffic modulations and bursting (or simulated).

## 8.2 Test Equipment

- 8.2.1 This section sets out the requirements for test equipment and how testing may be conducted.
- 8.2.2 The actual Access Provider Equipment and Access Seeker Equipment shall be used for the tests where possible.
- 8.2.3 The transmit power levels and modulations need to be from, or need to adequately simulate, the real life target systems. If simulation is used, the receiver noise performance and Interference performance characteristics should reflect the specification of the Access Provider Equipment and Access Seeker Equipment.
- 8.2.4 The equipment used by the Parties to test must operate in its linear operation range and must have adequate blocking, sensitivity and linearity, so that results show the actual Interference affects of the Access Provider Equipment and Access Seeker Equipment.
- 8.2.5 Spectrum analysers and/or signal generators, if used, shall be calibrated.

## 9 Access Provider's Forecasting

- 9.1 This section 9 sets out what the Access Provider's Forecast comprises and the requirements that the Access Provider must meet.
- 9.2 The Access Provider's current and reasonable forecast requirements for capacity ("Access Provider's Forecast") include the following:
- 9.2.1 any plans for the future expansion of capacity or capability of existing Telecommunications Services currently being provided at the Relevant Facilities;
- 9.2.2 any plans for the future deployment of Telecommunications Services that are provided by the Access Provider elsewhere but that are not provided at the Relevant Facilities;

9.2.3 any plans for the future deployment of new Telecommunications Services and for technology evolution requirements that are planned for deployment by the Access Provider but that are not currently operating.

9.3 The Access Provider's Forecast shall not extend for more than five years from the date when the Access Provider's Forecast was last updated in the Common Format Site Database.

9.4 The Access Provider's Forecast must be included in the Access Provider's site database and must also be disclosed in the Common Format Site Database at the time of the forecasting.

9.5 The Access Provider must have reasonable intent and the ability to deploy the Access Provider Forecasts which will be evidenced by the following:

9.5.1 the Access Provider must hold suitable spectrum management rights , or intend to acquire such rights, to deploy the relevant requirement; and

9.5.2 if relevant, the new Telecommunications Service or technology must be standardised and must be one which is recognised by the ITU.

9.6 The Access Provider must not use the Access Provider's Forecast for anti-competitive purposes.

9.7 The Access Seeker may only invoke the provisions of section 39 of the Mobile Co-location General Terms (Dispute Resolution) in respect of the Access Provider's Forecast if the Access Seeker reasonably believes that the Access Provider has not complied with clauses 9.3, 9.4 and 9.5 and then only in respect of whether or not the Access Provider has complied with those clauses.

## **10 Procedures for interference Management in Mobile Co-location**

10.1 Determination of Agreed Standard Solutions and Disagreed Solutions.

10.1.1 This section sets out the procedures for determining whether solutions shall be Agreed Standard Solutions or Disagreed Solutions.

10.1.2 At any time the Access Seeker may propose to the Access Provider a solution for a co-location installation type that conforms with this document.

10.1.3 The solution is to specify the combination of services to be co-located and the Standard Site Type, Antenna separation, Antenna arrangement, proposed Antenna geometry, RF filters and devices, frequency and bandwidth, EIRP and any other relevant details. This shall include details of the distances and dimensions.

10.1.4 The solution must:

- (a) Avoid Interference.

- (b) Not cause Unacceptable Performance Degradation to existing Telecommunications Services or to Access Provider's Forecast Telecommunications Services at or on the Relevant Facilities.
- (c) Comply with the Mobile Co-Location Operations Manual.

10.1.5 The Access Seeker is to provide an analysis of the projected level of Interference and Performance Degradation in relation to the proposed solution.

10.1.6 Following receipt of the proposed solution, the Access Provider will undertake a desktop study of the Interference and Performance Degradation that may occur.

10.1.7 The Access Seeker and the Access Provider will meet to discuss the results of the Interference analysis within twenty Working Days of the Access Seeker's solution proposal (this meeting to be referred to as the "Desktop Analysis Meeting").

10.1.8 The Access Provider's desktop study (referred to clause 10.1.6) and participation in the Desktop Analysis Meeting (referred to clause 10.1.7) will be charged for by the Access Provider in accordance with the Charges, as agreed between the Parties pursuant to the Mobile Co-location General Terms.

10.1.9 The outcome of the Desktop Analysis Meeting will be one of two scenarios:

- (a) If the Access Seeker and Access Provider agree that the paper based Interference study (i.e. a desktop study) indicates minimal risk of Interference and minimal risk of Unacceptable Performance Degradation to the Access Provider Equipment, both existing and forecasted at the Relevant Facilities, then the solution shall be defined as an "Agreed Standard Solution"; and may be deployed in accordance with clause 10.3; or
- (b) If either the Access Seeker or the Access Provider does not believe that the paper based studies indicate minimal risk of Interference, then experimental testing may be undertaken. If experimental testing is not agreed then the solution shall be a Disagreed Solution and may only be implemented under the protocol in clause 10.4.

10.1.10 If testing is agreed, the Access Seeker and Access Provider will meet within five Working Days of the completion of the Desktop Analysis Meeting, to discuss the nature of the tests to be completed, including, without limitation, the designated agreed test environment ("Testing Procedures Meeting"). If no agreement is reached after five Working Days, either the Access Seeker or the Access Provider can advance the issue using the expert determination in the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms.

10.1.11 Any testing will be completed within twenty Working Days of the Testing Procedures Meeting, or within a mutually agreed timeframe or as determined by the expert determination in the Dispute Resolution process.

10.1.12 The costs of any testing shall be met by the Access Seeker and the involvement of the Access Provider in agreeing and participating in the testing referred to in clauses 10.1.10 and 10.1.11 will be charged for by the Access Provider in accordance with the Charges, as agreed between the Parties pursuant to the Mobile Co-location General Terms.

10.1.13 The outcome of the testing process will be one of three scenarios:

- (a) If the Access Seeker and the Access Provider agree that the testing indicates a minimal risk of Interference and a minimal risk of Unacceptable Performance Degradation, the solution becomes an Agreed Standard Solution and may be implemented in accordance with the protocol provided in clause 10.3; or
- (b) If either the Access Seeker or the Access Provider does not agree that the testing indicates a minimal risk of Interference and a minimal risk of Unacceptable Performance Degradation, the solution shall be defined as a Disagreed Solution, and may be implemented in accordance with the protocol provided in clause 10.4; or
- (c) If the Access Seeker and the Access Provider agree that the testing indicates a significant risk of Interference or a significant risk of Unacceptable Performance Degradation the solution shall be a Non-Compliant Solution, and will not be built.

10.2 It is accepted that testing and analysis prior to the installation and operation of Access Seeker Equipment can only approximate reality and cannot eliminate the possibility that Unacceptable Performance Degradation will actually occur. For that reason, testing and monitoring once the Access Seeker Equipment is operating at the Relevant Facilities is required.

10.3 Protocol for deployment of an Agreed Standard Solution

10.3.1 This section sets out how an Agreed Standard Solution may be deployed and how it will be tested to avoid Unacceptable Performance Degradation occurring.

10.3.2 If a Full Site Application is rejected in accordance with the provisions of the Mobile Co-location Operations Manual solely for reasons relating to Interference or Performance Degradation, if the Access Seeker wishes, the Parties will meet within five Working Days to revise these elements of the Full Site Application. If the revised elements cannot be agreed within ten Working Days, or such other time as may be agreed, then the Access Seeker can either:

- (a) progress the issue as a Disagreed Solution; or
- (b) advance the issue using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms.

- 10.3.3 If the revised elements are agreed under clause 10.3.2, the Access Seeker may deploy that solution using this clause 10.3.
- 10.3.4 Once the Access Seeker Equipment has been commissioned and integrated on or with the Relevant Facilities in accordance with clause 19.3 of the Mobile Co-location Operations Manual, the Access Seeker shall design a measurement and testing program to test for Unacceptable Performance Degradation. The Access Seeker shall obtain the Access Provider's approval of the program. If the Access Provider does not approve the program, such approval not to be unreasonably withheld, the Access Seeker and Access Provider will meet within five Working Days to agree a measurement and testing program. If, within a further ten Working Days a measurement and testing program has not been agreed, the Access Seeker can advance the issue using the expert determination in the Dispute Resolution procedure in section 39 of the Mobile Co-location General Terms.
- 10.3.5 Following the approval, agreement or imposition of a measurement and testing program, the Access Seeker shall, unless it is agreed otherwise, undertake that measurement and testing program at the Relevant Facilities.
- 10.3.6 If, during the measurement and testing program, the Access Provider reasonably believes that there is more than a minimal risk of Unacceptable Performance Degradation occurring it will give Notice of this to the Access Seeker.
- 10.3.7 Upon receipt of such Notice, the Access Seeker will ensure no Unacceptable Performance Degradation occurs until a solution is agreed or is imposed by the Disputes Resolution process referred to in clause 10.3.9.
- 10.3.8 The Access Seeker and Access Provider will meet within one Working Day of the Notice to attempt to resolve the issue. The Access Seeker and Access Provider will work together mutually and in good faith to find a solution.
- 10.3.9 If the Access Seeker and Access Provider cannot agree a solution within five Working Days, then the issue can be advanced using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms.
- 10.3.10 If the Access Provider agrees that the measurement and testing program referred to in clauses 10.3.4 and 10.3.5, indicates no more than a minimal risk of Unacceptable Performance Degradation occurring the Access Seeker may proceed to give Notice under clause 10.3.11.
- 10.3.11 The Access Seeker must provide to the Access Provider and any Existing Co-locator not less than ten Working Days Notice of the intention to start radiating power.
- 10.3.12 When the Access Seeker begins to radiate power from the Access Seeker Equipment at the Relevant Facilities, it will operate at maximum configuration for the first five days of radiation. "Maximum Configuration" means the maximum power and the maximum number of channels and carriers which have been agreed with the Access Provider for the Access Seeker Equipment installed at the Relevant Facilities, ("Maximum Configuration").

- 10.3.13 If it is not possible to operate at or simulate the Maximum Configuration then prior to the Access Seeker radiating the Access Seeker, Access Provider and any Existing Co-locator will meet within one Working Day to discuss a solution. If a solution cannot be found, the Access Seeker shall give ten Working Days Notice prior to increasing the configuration of the Access Seeker Equipment at the Relevant Facilities. The steps in clauses 10.3.11, 10.3.12, 10.3.15-10.3.24 will then apply as if the increase in configuration is the start of the radiating from the Relevant Facilities.
- 10.3.14 If a solution is found then the Access Seeker Equipment at the Relevant Facilities will operate at Maximum Configuration for five days.
- 10.3.15 If, during the five days of operating at Maximum Configuration, the Access Provider or any Existing Co-locator reasonably believes that there is Unacceptable Performance Degradation it will give Notice of this to the Access Seeker.
- 10.3.16 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.
- 10.3.17 The Access Seeker, Access Provider and any Existing Co-locator will meet within one Working Day of the Notice of Unacceptable Performance Degradation to attempt to resolve the issue. The Access Seeker, Access Provider and any Existing Co-locator will work together mutually and in good faith to find a solution.
- 10.3.18 If the Access Seeker, Access Provider and any Existing Co-locator cannot agree a solution within five Working Days, then the issue can be advanced using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms. Until a solution is found, whether by agreement or through Dispute Resolution, the Access Seeker must not permit the Unacceptable Performance Degradation to continue.
- 10.3.19 If no Unacceptable Performance Degradation is observed during the five days of operation at Maximum Configuration then the Access Seeker Equipment may be reduced to its normal configuration.
- 10.3.20 If at any stage during the first two months of operation at normal configuration, the Access Provider or any Existing Co-locator reasonably believes that Unacceptable Performance Degradation is occurring, it will give Notice of this to the Access Seeker.
- 10.3.21 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all the Access Seeker Equipment at the Relevant Facilities.
- 10.3.22 The Access Seeker, Access Provider and any Existing Co-locator will meet within one Working Day of the Notice of Unacceptable Performance Degradation to attempt to resolve the issue.

The Access Seeker, Access Provider and any Existing Co-locator will work together mutually and in good faith to find a solution.

10.3.23 If the Access Seeker, Access Provider or any Existing Co-locator cannot agree on a solution within five Working Days, then the issue can be advanced using the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms. Until a solution is found, whether by agreement or through Dispute Resolution, the Access Seeker must not permit the Unacceptable Performance Degradation to continue.

10.3.24 If there is no Unacceptable Performance Degradation at the conclusion of the two months of operation at normal configuration the Access Seeker may proceed to prepare the Project Closure Checklist referred to in clause 19.5 of the Mobile Co-location Operations Manual.

10.3.25 If the Access Seeker fails to comply with its obligations under clauses 10.3.16; 10.3.18; 10.3.21 or 10.3.23 then the Access Provider shall be entitled to take such steps as are reasonably necessary to alleviate Unacceptable Performance Degradation. This shall include, without limitation, the right to gain access to the Access Seeker Equipment, or any Utility Services used by the Access Seeker, to de-power or completely turn off the Access Seeker Equipment.

#### 10.4 Protocol for the Deployment of a Disagreed Solution

10.4.1 This section sets out how a Disagreed Solution may be deployed and how it will be tested to avoid Unacceptable Performance Degradation occurring.

10.4.2 If the Access Seeker wishes to proceed with a Disagreed Solution it will give Notice of this to the Access Provider.

10.4.3 The Parties will meet within ten Working Days of receipt of the Notice to revise the proposed solution. If a revised solution cannot be agreed within a further twenty Working Days, the solution shall be deemed non-compliant and not be built.

10.4.4 If a revised solution is agreed, the Access Seeker may make a Full Site Application. If Conditional Site Approval is issued the solution shall be deployed in accordance with this clause 10.4.

10.4.5 Once the Access Seeker Equipment has been commissioned and integrated on or with the Relevant Facilities in accordance with clause 19.3 of the Mobile Co-location Operations Manual, the Access Seeker shall design a measurement and testing program to test for Unacceptable Performance Degradation. The Access Seeker shall obtain the Access Provider's approval of the program. If the Access Provider does not approve the program, such approval not to be unreasonably withheld, the Access Seeker and Access Provider will meet within five Working Days to agree a measurement and testing program. If, within a further ten Working Days, a measurement and testing program has not been agreed, the Access Seeker can advance the issue using the expert determination procedure of the Dispute Resolution procedure in section 39 of the Mobile Co-location General Terms.

- 10.4.6 Following the approval, agreement or imposition of a measurement and testing program, the Access Seeker shall, unless it is agreed otherwise, undertake that measurement and testing program at the Relevant Facilities.
- 10.4.7 If, during the measurement and testing program, the Access Provider reasonably believes that there is more than a minimal risk of Unacceptable Performance Degradation occurring it will give Notice of this to the Access Seeker.
- 10.4.8 Upon receipt of such Notice, the Access Seeker will ensure no Unacceptable Performance Degradation occurs until a solution is agreed or is imposed by the Disputes Resolution process referred to in clause 10.4.10.
- 10.4.9 The Access Seeker and Access Provider will meet within one Working Day of the Notice to attempt to resolve the issue. The Access Seeker and Access Provider will work together mutually and in good faith to find a solution.
- 10.4.10 If the Access Seeker and Access Provider cannot agree a solution within five Working Days, then the issue can be advanced using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms.
- 10.4.11 If the Access Provider agrees that the measurement and testing program referred to in clauses 10.4.5 and 10.4.6, indicates no more than a minimal risk of Unacceptable Performance Degradation occurring the Access Seeker may proceed to give Notice under clause 10.4.12.
- 10.4.12 The Access Seeker must provide to the Access Provider and any Existing Co-locator not less than twenty Working Days Notice of the intention to start radiating power.
- 10.4.13 The Access Seeker may only begin to radiate power during a designated low traffic period, as determined by the Access Provider. The Access Seeker will radiate power for a period of no more than 30 minutes and will then stop radiating.
- 10.4.14 If, during the 30 minute radiation, either the Access Provider or any Existing Co-locator reasonably believes that Unacceptable Performance Degradation is occurring, it will give Notice of this to the Access Seeker.
- 10.4.15 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.
- 10.4.16 If the Access Provider and any Existing Co-locator are satisfied that there is no Unacceptable Performance Degradation occurring during or as a result of the 30 minutes of radiation undertaken pursuant to clause 10.4.13 then the Access Seeker may give Notice to the Access Provider that it will proceed to activate the Access Seeker Equipment at the Relevant Facilities at limited power levels and capacity, for no more than one hour during a normal traffic period, and then shut down. The limited power levels, capacity and normal traffic period shall be determined by the Access Provider.

10.4.17 If either the Access Provider or any Existing Co-locator reasonably believes that there is Unacceptable Performance Degradation occurring during or as a result of the radiation period referred to in clause 10.4.16, it will give Notice of this to the Access Seeker.

10.4.18 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.

10.4.19 If the Access Provider and any Existing Co-locator are satisfied that there is no Unacceptable Performance Degradation occurring during or as a result of the radiation period referred to in clause 10.4.16 then the Access Seeker will give Notice to the Access Provider that it intends to activate the Access Seeker Equipment at the Relevant Facilities at full power levels and full capacity for no more than one hour during a normal traffic period and shall then stop radiating. The full power levels, capacity and normal traffic period shall be determined by the Access Provider.

10.4.20 If either the Access Provider or any Existing Co-locator reasonably believes that there is Unacceptable Performance Degradation occurring during or as a result of the radiating period referred to in clause 10.4.19, it will give Notice of this to the Access Seeker.

10.4.21 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.

10.4.22 If the Access Provider and any Existing Co-locator are satisfied that there is no Unacceptable Performance Degradation occurring during or as a result of the radiating period referred to in clause 10.4.19, then the Access Seeker will give Notice to the Access Provider that it intends to activate the Access Seeker Equipment at the Relevant Facilities at full power levels and full capacity for one day and then stop radiating. The full power levels and full capacity shall be determined by the Access Provider.

10.4.23 If either the Access Provider or any Existing Co-locator reasonably believes that there is Unacceptable Performance Degradation occurring during or as a result of the radiating period referred to in clause 10.4.22, it will give Notice of this to the Access Seeker.

10.4.24 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.

10.4.25 If the Access Provider and any Existing Co-locator are satisfied that there is no Unacceptable Performance Degradation occurring during or as a result of the radiating period referred to in clause 10.4.22, then the Access Seeker may proceed to activate the Access Seeker

Equipment at the Relevant Facilities under normal operating conditions supporting standard commercial traffic for one day and then stop radiating.

10.4.26 If either the Access Provider or any Existing Co-locator reasonably believes that there is Unacceptable Performance Degradation occurring during or as a result of the radiating period referred to in clause 10.4.25, it will give Notice of this to the Access Seeker.

10.4.27 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities, as requested by the issuer of the Notice.

10.4.28 If the Access Provider and any Existing Co-locator are satisfied that there is no Unacceptable Performance Degradation occurring during the radiating period referred to in clause 10.4.25, then the Access Seeker may proceed to activate the Access Seeker Equipment at the Relevant Facilities under normal operating conditions supporting standard commercial traffic on a continuous basis.

10.4.29 If at any stage during the first twelve months of normal operation, the Access Provider or any Existing Co-locator reasonably believes that Unacceptable Performance Degradation is occurring, it will give Notice of this to the Access Seeker.

10.4.30 Upon receipt of such Notice of Unacceptable Performance Degradation, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities.

10.4.31 If a Notice of Unacceptable Performance Degradation is given under any of clauses 10.4.14, 10.4.17, 10.4.20, 10.4.23, 10.4.26 and 10.4.29, the Access Seeker, Access Provider and any Existing Co-locator will meet within one Working Day of the Notice to attempt to resolve the issue. The Access Seeker, Access Provider and any Existing Co-locator will work together mutually and in good faith to find a solution.

10.4.32 If the Access Seeker, Access Provider and any Existing Co-locator cannot agree on a solution within five Working Days, then the issue can be advanced using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms. Until a solution is found, whether by agreement or through Dispute Resolution, the Access Seeker must not permit Unacceptable Performance Degradation to occur. If a solution is found, then the Access Seeker may take the next step (if any) of the radiation period testing or, if that testing is complete, may return to operation in accordance with the solution.

10.4.33 If at any stage during the testing the Access Provider and the Access Seeker agree that Unacceptable Performance Degradation, is occurring, the solution will be deemed to be a Non-Compliant Solution.

10.4.34 The Access Seeker may not make any change to the solution tested in this section, other than as agreed with the Access Provider as provided for in this section 10. Any change will require a new Initial Site Application.

10.4.35 If the Access Seeker fails to comply with its obligations under clauses 10.4.8; 10.4.15; 10.4.18; 10.4.21, 10.4.24, 10.4.27, 10.4.30, 10.4.32 or 10.3.34 then the Access Provider shall be entitled to take such steps as are reasonably necessary to alleviate Unacceptable Performance Degradation. This shall include, without limitation, the right to gain access to the Access Seeker Equipment, or any Utility Services used by the Access Seeker, to de-power or completely turn off the Access Seeker Equipment.

#### 10.5 Non-Compliant Solution Protocol

10.5.1 The Access Seeker will not build any Non-Compliant Solutions and any solutions which become Non-Compliant shall be removed. If the Access Seeker and Access Provider agree that Unacceptable Performance Degradation occurs from a Disagreed Solution, the Disagreed Solution will at that point become a Non-Compliant Solution and shall be removed.

10.5.2 If as a result of Dispute Resolution the Access Seeker may not radiate from the Relevant Facilities, or where it is decided in the Dispute Resolution process that any radiation from the Access Seeker Equipment at the Relevant Facilities will cause Unacceptable Performance Degradation, then this shall be deemed to be a Non-Compliant Solution and shall be removed.

## 11 Protocol for Ongoing Interference Management

11.1 This section sets out how Unacceptable Performance Degradation which occurs outside the time frames of clauses 10.3 and 10.4 shall be managed but it shall only apply where the Access Seeker and the Access Seeker Equipment complies with both the terms of the Final Site Application and the solution finally agreed under clauses 10.3 or 10.4.

11.1.1 If at any time after:

- (a) The first two months of normal operation of an Agreed Standard Solution; or
- (b) The first twelve months of normal operation of a Disagreed Solution;

either the Access Seeker, the Access Provider or any Existing Co-locator reasonably believes that Unacceptable Performance Degradation is occurring it may give Notice requiring the other Party or Parties to meet to attempt to resolve the issue.

11.1.2 If such Notice is given by any Party, the Parties will meet within five Working Days of the Notice and agree that they will work together to identify techniques to avoid or mitigate Unacceptable Performance Degradation.

11.1.3 If the Parties cannot agree to appropriate mitigation methods or the mitigation methods agreed, do not reduce the Performance Degradation to an acceptable level,

then the issue can be advanced using the expert determination procedure of the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms.

11.2 This section sets out how Unacceptable Performance Degradation which occurs outside the time frames of clauses 10.3 and 10.4 shall be managed where the Access Provider determines that the Access Seeker and/or the Access Seeker Equipment does not comply with either the Final Site Application or the solution finally agreed under clause 10.3 or 10.4. This section shall apply regardless of whether the Access Seeker has obtained a Permit to Work or Planned Work Approval under the Mobile Co-location Operations Manual.

11.2.1 If at any time after:

- (a) The first two months of normal operation of an Agreed Standard Solution; or
- (b) The first twelve months of normal operation of a Disagreed Solution;

either the Access Seeker, the Access Provider or any Existing Co-locator reasonably believes that Unacceptable Performance Degradation is occurring it may give of this to the Access Seeker.

11.2.2 Upon receipt of such Notice, the Access Seeker will immediately take measures to alleviate the Unacceptable Performance Degradation up to and including de-powering and/or completely turning off some or all of the Access Seeker Equipment at the Relevant Facilities.

11.2.3 The Access Seeker, Access Provider and any Existing Co-locator will meet within one Working Day of the Notice of Unacceptable Performance Degradation to attempt to resolve the issue. The Access Seeker, Access Provider and any Existing Co-locator will work together mutually and in good faith to find a solution.

11.2.4 If the Access Seeker, Access Provider and any Existing Co-locator cannot agree on a solution within five Working Days, then the issue can be advanced using the Dispute Resolution procedures in section 39 of the Mobile Co-Location General Terms. Until a solution is found, whether by agreement or through Dispute Resolution, the Access Seeker must not permit Unacceptable Performance Degradation to occur.

11.2.5 If the Access Seeker fails to comply with its obligations under clauses 11.2.2 and 11.2.4 then the Access Provider shall be entitled to take such steps as are reasonable necessary to alleviate Unacceptable Performance Degradation. This shall include, without limitation, the right to gain access to the Access Seeker Equipment, or any Utility Services used by the Access Seeker, to de-power or completely turn off the Access Seeker Equipment.

11.3 In the event that an Access Seeker has Access Seeker Equipment installed at the Relevant Facilities when another Access Seeker installs its Access Seeker Equipment at those Relevant Facilities, the Access Seeker with installed Access Seeker Equipment shall be bound to clauses 10.3, 10.4 and 11, where relevant, as an Existing Co-locator.

## 12 Expansion or Modification of Access Seeker Equipment

12.1 This section sets out how Access Seeker Equipment may be modified or expanded. This section shall not apply to Access Seeker Equipment which was deployed as a Disagreed Solution.

12.1.1 In the event that the Access Seeker wishes to expand or modify (other than reduce) the configuration of any Access Seeker Equipment, it must follow the procedure for making a Planned Work Application (clause 42.4 of the Mobile Co-location Operations Manual) or must make an Initial Site Application. "Expand or Modify" in this clause shall exclude maintenance, repairs or fault rectification which, under the Mobile Co-location Operations Manual, require only a Permit to Work.

12.1.2 In the event that the Access Seeker expands and/or modifies (other than reducing) the Access Seeker Equipment at a Site without complying with clause 12.1.1 or clause 10.3.12, the Access Provider or any Existing Co-locator may give Notice to the Access Seeker requiring it to immediately de-power and/or switch off the Access Seeker Equipment.

12.1.3 Upon receipt of such Notice the Access Seeker shall immediately de-power and/or switch off the Access Seeker Equipment.

12.1.4 If the Notice relates to a failure to comply with clause 10.3.12 then the Access Seeker may only reactivate the Access Seeker Equipment once it has complied with clauses 10.3.11, 10.3.12, 10.3.15-10.3.24.

12.1.5 If the Notice relates to a failure to comply with clause 12.1.1, then the Access Seeker may only reactivate the Access Seeker Equipment if it is reduced or modified to comply with the configuration approved in the Final Site Approval.

12.1.6 If the Access Seeker fails to comply with clauses 12.1.1, 12.1.3, 12.1.4 or 12.1.5 then the Access Provider shall be entitled to take such steps as are reasonably necessary to depower and/or switch off the Access Seeker Equipment including de-powering and/or switching off any Utility Services used by the Access Seeker.

## 13 Licensing

### 13.1 Spectrum Licensing Process

13.1.1 The Radiocommunications Act 1989 and its subsequent modifications govern the licencing process. However, there are issues specific to mobile co-location that are not explicitly addressed in the Radiocommunications Act 1989.

13.1.2 Before the Access Seeker may issue a new spectrum licence, modify an existing spectrum licence or apply for a radio licence at Relevant Facilities it must:

- (a) take into account and allow for services already operating at the Relevant Facilities;

- (b) take into account and allow for services that are forecast to operate at the Relevant Facilities; and
- (c) take steps to ensure that Unacceptable Performance Degradation will not occur as a consequence of any service covered by the proposed new or modified spectrum licence.

13.1.3 If the Access Provider wishes to modify existing licences will give considerations to existing services at the Relevant Facilities.