DESIGN GUIDELINES FOR DISTRIBUTED ANTENNA SYSTEMS (DAS) – Consultation Outcomes

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Contents

1 Executive Summary

As part of a staged program, the Australian Mobile Telecommunications Association (**AMTA**) has been consulting with stakeholders to further develop and improve the draft Distributed Antenna System (**DAS**) Design Guidelines (**Guidelines**), and to include guidance on designing and installing DAS to accommodate new spectrum and technology changes, and specifically to support the deployment of 5G capable network infrastructure.

The intention of the Guidelines is to assist end-users to receive a carrier-grade service in locations where terrestrial mobile network coverage may be affected by the built environment or is insufficient to meet capacity demands.

AMTA received 14 submissions to the consultation paper dated 31st October 2023. This outcomes paper summarises the feedback in the submissions, as well as AMTA's consideration and response to the feedback.

Major Changes between 1st and 2ND Drafts

Based upon industry feedback, several areas of the document have been updated:

- *Process and engagement*

    a. The building of a DAS usually involves three key stakeholders, and their typical responsibilities and interactions have been added.
    b. A typical DAS design and delivery process flow and the typical interactions of the key stakeholders, from DAS inception to completion, ready for Carrier connection have been detailed.

- *Choice and flexibility*

    a. The Guidelines are voluntary and are intended to outline the recommended minimum design, engineering, operational aspects and performance criteria for a DAS to meet its objectives.
    b. When designing or constructing a DAS, stakeholders remain free to adopt their own approach which may deviate from the principles set out in the Guidelines. Other approaches may be suitable where all regulatory, operational, security, and health and safety standard requirements are met.
    c. A "**DAS Infrastructure Operator**" has been added to the Guidelines as a potential stakeholder. DAS Infrastructure Operators are third parties that can perform the functions of a 'Lead Carrier'. The DAS Infrastructure Operator may, or not, provide a turnkey service to a building owner providing a service facilitating inbuilding coverage from some, or all, mobile network providers. The inclusion of and reference to DAS Infrastructure Operators in the Guidelines is in recognition that there are different ways for DAS infrastructure to be built, maintained and owned.

- *Removal of redundant technical details and reordering*

    a. The Guidelines have had redundant technical details removed where they did not add value and were detailed and operational in nature.
    b. The Guidelines have been re-ordered with higher level planning information being separated from the more detailed implementation information.

2 Introduction

AMTA has been seeking industry input and feedback on the draft DAS Guidelines through a work program led by the IBC Working Group within AMTA. The purpose of the Guidelines is to provide guidance for the installation of network equipment in buildings and other infrastructure so that by compliance with the Guidelines, building owners and occupiers can be confident that mobile carriers will be capable of connecting their equipment and providing high quality coverage within the facility. The Guidelines provide a series of recommended technical standards and procedures to facilitate multi-carrier access to a DAS.

In October 2023, AMTA released a draft of the DAS Design Specification 2023 for consultation. This consultation period closed in December 2023, and AMTA received 14 submissions which have been carefully considered.

Table 1: AMTA's Inbuilding Communications Distributed Antennae Systems Program

Project stage		Timeframe
Stage 1	Review 2018 Specifications and Draft 2023 Specifications	Completed in October 2023
Stage 2	Seek input from industry	Completed December 2023
Stage 3	Industry input addressed in 2024 Guidelines Draft 2	Completed
Stage 4	Present Draft 2 of Guidelines to Industry	Consultation expected to commence in 29 October

3 Summary of submissions and consultation outcomes

Prior to issuing the Guidelines, AMTA aims to ensure that it has consulted comprehensively with all interested stakeholders, considered their views, and developed balanced positions in response. This section briefly summarises key themes from the 14 submissions to the consultation and the consultation outcomes, before providing more specific details in the table below. There were a range of inputs from the industry and from the building owners, via the Property Council of Australia.

The DAS Process
There were several submissions requesting clarity around the end-to-end process of commissioning, designing, building a compliant DAS.

The building of a typical DAS involves different parties with differing roles and responsibilities that must cooperate in the process and this can sometimes lead to a lack of clarity as to roles. There were several submissions raising queries as to which party is typically responsible for certain actions as well as the proposed timing for those actions.

To make this clearer, the typical roles and responsibilities for the key stakeholders, as well as their interactions with one another, have been mapped out within the Guidelines. In addition, the typical end-to end DAS Design and Construction Process has been mapped out, with the expected decisions and documents identified for each step.

The objectives of these two elements are to clarify the typical roles and responsibilities of each party and to map out where and when decisions, input and deliverables are often required. The intention behind these amendments is to assist in making the DAS process easier, quicker and cheaper for stakeholders.

Lead Carrier
There were several submissions seeking clarity around the role of the Lead Carrier.

AMTA's view is that, generally, a Lead Carrier is a Carrier engaged contractually by a Building Owner to provide Carrier base station connection and ongoing maintenance/fault management. It is recommended that the Lead Carrier is engaged early in the process of building a DAS, as they generally will have real-world experience in designing, managing, operating and maintaining the DAS. In response to feedback, the role of the Lead Carrier is more clearly identified and mapped out in the processes described above.

If for any project or building, a Lead Carrier is not appointed, then the Guideline makes it clear that the words “Lead Carrier’ are to be interpreted as referring to all Carriers that are intended to use the DAS.

The term ‘Lead Carrier’ may also include a third-party DAS Infrastructure Operator (i.e. third parties that can perform the functions of a ‘Lead Carrier’). This is a new concept incorporated in the Guidelines. This indicates the potential for alternative business models and for non-carriers to perform this role and the flexibility of different models for DAS infrastructure to be built, maintained and owned.

Voluntary Guidelines
There were diverging submissions regarding technology choices, some submissions advocated for less prescription to increase choice and lower prices; whereas other submissions argued for increased prescription to ensure the quality of outcomes and DAS installations. Several submissions provided feedback that if adopted would favour a specific vendor solution.

In updating the draft Guidelines, AMTA has followed the approach below:

- To not include product specifications within the Guidelines
- To be open to new and emerging technologies
- To be outcomes orientated and vendor agnostic
- To be open to testing what is practical rather than be prescriptive on testing all possible combinations

and permutations e.g. a minimum set of tests, rather than all tests.

As an example of this, the 5G section has been clarified for building owners and designers to assist them to understand the limitations of SISO solutions and the opportunity of designing MIMO solutions.

It is important to clarify that the Guidelines are voluntary and are intended to outline the recommended minimum design, engineering, operational aspects and performance criteria for a DAS. The Guidelines are intended to provide a source of information for stakeholders as to the current view of best practice and should be read in that light.

Stakeholders remain free to adopt their own approach which may deviate from the principles set out in the Guidelines when designing or constructing a DAS. There is no requirement for stakeholders (including building owners and developers) to build in accordance with the Guidelines.

However AMTA's view is that a DAS which is constructed in a manner consistent with the Guidelines will enable connection by all Carriers.

Fixed Cost Pricing
Several submissions requested that pricing be included in the guidelines. AMTA has carefully considered this request, but made the decision not to incorporate recommended pricing for the following reasons:

- The guidelines are technical in nature and commercial aspects are not within the scope of the guidelines;
- AMTA does not have the relevant information to enable it to advise on or recommend pricing;
- Pricing is likely to change as costs change and will likely also vary depending on the infrastructure in question; and
- Each Carrier must compete individually on pricing.

Lifts and Stairwells

There was feedback in the submissions that the solutions available in the market to fully provide coverage within Lifts and Stairwells could be considered unnecessary or 'gold-plating'. The revised draft Guidelines now recommend a minimum viable solution, based upon real world experience.

Solution Categories
Some submissions noted that there are differing needs for different types of building, as well as within the building itself. The revised draft Guidelines have mapped out the typical configurations for each building type and have now identified the different factors that should be considered for a simple and a complex installation, based upon the building's occupancy and positioning in the market.

Documentation
The recommended documentation to be submitted to the Lead Carrier at the Preliminary Design and Final Handover stages has been clarified, in response to industry feedback

Testing
The testing regime which is recommended in the Guideline has now been made more practical, based upon industry experience and the availability of testing equipment in Australia. In addition, the recommended testing for cold-shell buildings is clarified and the trade-offs of minimum designs and their longevity have been identified.

4 Summary feedback and consideration

Submitter	Submission	AMTA Response
B	5G Coverage Concerns regarding the sentence " […] a decision to not incorporate MIMO and/or sufficient capacity into a DAS may result in Carriers being unable to supply 5G within that building and potentially the need for upgrades to the DAS to enable supply of 5G services in the future." Being ambiguous and not being open to SISO as a solution. Concerns were raised regarding the downplaying of a SISO DAS versus a MIMO DAS.	The typical benefits of MIMO over SISO have been detailed for a better understanding of why and where each solution is appropriate. The potential impact of not using MIMO in a 5G solution has been clarified.
B	Concerns with regards to Grandfathering and Transition Arrangements, when the new Guidelines come into force.	AMTA does not consider that is necessary to include grandfathering provisions in the Guidelines. The guidance provided in the Guidelines will not be determinative of a Carrier's decision whether to connect or accept the handover of an installed DAS. Carriers will continue to make their own independent decisions about whether to connect to any particular DAS (irrespective of whether it meets the Guidelines).
B	There were noted some feedback that service levels, and spare parts for maintenance are often delayed.	The Guidelines do not address nor cover any commercial arrangements that may be negotiated or agreed between Carriers and stakeholders. These are matters that fall beyond the scope of AMTA's role.

		It should be noted that the telecommunications technology life-cycle is less than a building structure. As equipment vendors manage the end the support of a product, then spares become harder to obtain. It is recommended that the most contemporary solutions be considered within a design.
H	Guiding Principles It was noted that some the draft document was inconsistent with regulations with regards to the use of words "Must" and "Shall".	Terminology has been clarified in the Guidelines.
H/D/M/G	Lead Carrier Engagement A series of general comments with regards to engagement with a lead carrier.	AMTA has developed a typical process and workflow for building owners and designers to engage with a Lead Carriers. The Lead Carrier responsibilities and input to an IBC solution are detailed for a better understanding of the overall interactions with Building Owners and DAS Contractors. As explained above, the Guidelines now include a 'DAS Infrastructure Operator' as a new concept.
H	General DAS description Hybrid DAS specification needed clarification	Agree that there should be no mixing of architectures. The Hybrid DAS description has been updated with more detailed language to avoid ambiguity. Guidelines now read "A DAS design may consist of a combination of DAS architectures however, for any single RF sector it is recommended that there should be no mixture of passive and

		other DAS architecture segments”
H/D/M/F/C	MIMO A range of comments made with regards to MIMO, when to recommend and in what circumstances	The SISO/MIMO and Complex building section have been clarified: • By Building types • By Solutions • By Complexity • By areas within a building The typical benefits of MIMO over SISO have been detailed for a better understanding of why and where each solution is appropriate. The potential impact of not using MIMO in a 5G solution has been clarified.
H	Solution Categories	The Solution categories section has been updated. Generic and specific site requirements have been separated for simplification. • By Building types • By Solutions • By Complexity • By areas within a building Guidance is provided based on experience for different types of buildings such as residential, hospitals, tunnels etc. Cold-shell building installations are addressed.
H	PIM Performance requirements	Section has been rewritten with input from the tech committee. The PIM tests that are recommended have been reduced to MNC Inputs (Passive) and Hybrid Remote Output (into passive branch) only. The recommended testing levels and procedure has been better defined.
H	Approved Material List	AMTA will host the approved

		material lists on the AMTA website.
C	Comment that the commercial and technical aspects to a DAS become conflicted with commercial aspects.	Guidelines focus on recommended technical aspects, leaving the commercial aspects for negotiations. AMTA continues to educate the market on the need to engage early in the design phase, to plan for a complex piece of in-building infrastructure that meets industry and consumer expectations. Previous information relating to post Carrier connection activities have been removed. Typical key stakeholder relationships and responsibilities have been set out in the Guidelines.
C	Comments with regards to how the industry operates with regards to DAS Planning. Belief that the complete needs and requirements should be documented, but rarely is a contractor furnished the time to achieve this.	AMTA believes that major pieces of inbuilding infrastructure requires a consultative process. The Guidelines are intended to outline the recommended minimum design, engineering, operational aspects and performance criteria for a DAS. AMTA will continue to educate the market on the need to engage early in the design process and has set out a recommended engagement workflow.
C	Design Principles Comments of Lead Carrier/All Carrier engagement and need for design elements components to be exhaustive.	AMTA has noted the feedback and updated these guidelines to have a clearer engagement for the Lead Carrier and outlined that these are guidelines. Supplier lists of supported design components to be hosted on the AMTA website.

D/M/F	Operating Frequency Bands Noted that some technical elements needed to be clarified.	AMTA reviewed these comments with the technical committee, and it is proposed that a DAS will be required to provide coverage on all these frequency bands (in Section 4.3), subject to approved products being available which support these bands
L	Design Principles Comments submitted that the business model for a DAS should change. Comments on TCO and ROI for a DAS, and how MNO should move away from CAPEX model.	The Guidelines do not address nor cover any commercial arrangements that may be negotiated or agreed between Carriers and stakeholders. Nor do the guidelines reflect the business model of the Carriers or DAS Infrastructure Operator. These are matters that fall beyond the scope of AMTA's role.
K/N/F	Other Frequency ranges Where other types of communications services are needed. E.g. non-cellular, Wi-Fi, public safety.	Section on non-cellular was removed as was any reference to frequencies outside those used by the three mobile carriers.
M/K/F/G/C	DAS Performance Capability Lead Carrier process was unclear. MIMO as a prerequisite for 5G.	The recommended lead carrier process has been explained in a clearer manner. The typical benefits of MIMO over SISO have been detailed for a better understanding of why and where each solution is appropriate. The potential impact of not using MIMO in a 5G solution has been clarified.
L	EME Design constraints Make the documentation for “EME Compliance for IBC and DAS Systems” available for designers	AMTA has placed the current EME documentation on the RFNSA website. Designers can access by following the directory instructions below: **“RF Safety Program\Docu**

		mentation – RF Safety Compliance \2024 IBC EME Compliance".
D	Cable Labelling Suggested 6 m intervals	AMTA agrees that for correct cable identification labelling is important. The document retains the 6m interval recommendation.
M/K/F/G/C	Active DAS/Higher power Active Elements Various comments on approved hardware lists and the lead carrier process	AMTA to host the applied supplier lists covering active and passive elements on the AMTA website. The recommended Lead Carrier process and engagement workflow is now explained more clearly within the guidelines. As explained above, the Guidelines now include a 'DAS Infrastructure Operator' as a new concept.
M/K/F/G/C	Target Coverage Area Various comments regarding TCA and Exemption Zones early in process before a Lead Carrier is chosen Exemption Zones	The recommended Lead Carrier engagement process is explained, and typical benefits highlighted which includes determining TCA and exemption zones. AMTA's recommendation is that as a starting point, the target coverage area should be the whole building. Exemption zones section has been clarified to indicate exemption zones are allowable but will note that with the increasing dependency on mobile communications for building managers and maintenance staff, exemption zones may be a false economy in the long term for owners.
H/D/K/F/A/N	Solution Categories	Guidelines have been simplified and covers recommendations for both standard and complex scenarios.

		Common categories for building have been rolled up together and only complex scenarios have been expanded upon. A statement regarding MIMO for 5G has been added.
K/A/F/C/L	RF Levels Required Various comments with regards to RF levels and the DAS interaction with external macros. Want vendor prices within the document.	The determination of existing macro interaction with a proposed DAS has been simplified while maintaining the view that early Lead Carrier engagement will assist in this area. No prices can be set or published in the Guideline as explained above.
M/F	Request for improved engagement with regards to Handover Zone Wanted pricing included for designers	In order to facilitate the process the recommended Lead Carrier engagement process is now explained. No prices can be set or published in the Guideline as explained above.
E	Fire stairs Comment was that Fire Stairs are Best Effort category	The same recommended methodology applies as for lifts (antenna appropriately placed alongside) with supporting coverage heat maps indicating target coverage levels are met as far as is possible.
E/D/F/L	Prelim Doc Various comments on what should be in Prelim and final design docs.	AMTA has addressed these comments in the revised draft Guidelines.
H/D/E/A/N/F	Detailed Design Docs For sites under construction, there are issues with finalising modelling.	The recommended documentation section has been updated to reflect feedback. Carrier advice on modelling challenges in cold shell constructions have been included. AMTA recommends

		pre-walk tests and design criteria.
H/E/F/J	Spares management in original specification. IBC EME Guide needs to be easily accessible.	Spares management has been removed as these are a commercial in nature. EMEG needed in design phase to ensure that the design will be compliant. EME/RF guides hosted in the RFNSA site to now be hosted on the AMTA site for public access.
A/F/J	PIM and PIM Testing	Guidance has been clarified PIM typical source list included
N	Wideband Noise	Wideband Noise typical source list included.
A/N/F/J	Walk Tests Discussion on testing all carriers on all bands – excessive Tunnel Tests	Agreed that the recommended testing was excessive – simplified to CW tests only For tunnels – recommended that the Lead Carrier and Designer discuss appropriate solution.
K	Carrier Equipment Room dimensions.	Typical requirements have been updated.
F	DAS Planning Future proof	It is best practice that DAS be designed to cater to all bands for all operators as set out under the Guideline - flexibility is key to future proofing and ultimately property owner can discuss design with carriers to obtain advice/recommendations.
H/F	Approved Material List	Carrier material lists hosted on the AMTA website
F	Clarify type of cables, number of fibre cores per sector, and if Carriers will supply the cables. Eg for remote or active	AMTA does not believe that this guideline can answer all questions with regards to remote equipment.

	equipment.	
E/M/K/F/C	Lifts and how to provide coverage to lifts.	The recommended lift coverage design section has been re-written. There are many options, and this is typically a commercial decision by the building owner to meet the needs of the occupiers.