5. Output specifications

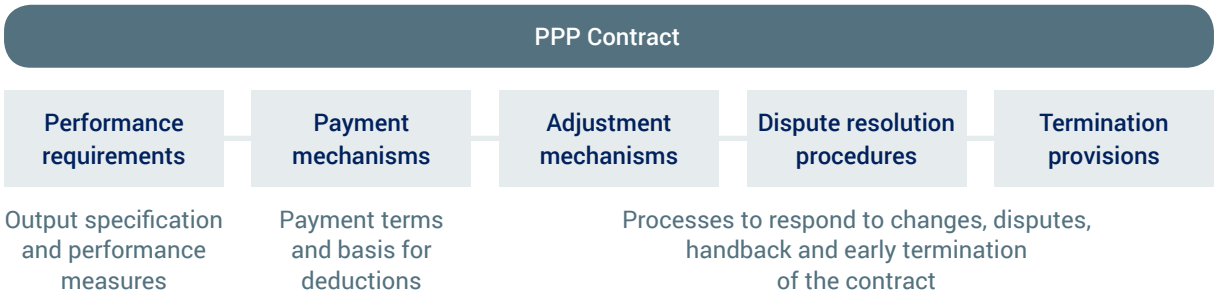
An output specification is a technical specification that predominantly adopts performance-based requirements to define the project scope. It is the technical foundation of both the procurement and delivery phases and is used to determine technical compliance. This section describes an output specification, provides an overview of a typical output specification structure, and presents a framework to identify requirements. It also describes the relationship between an output specification, the payment mechanism and the performance measures, and outlines the qualities of a good output specification.

5.1 WHAT IS AN OUTPUT SPECIFICATION?

The technical specifications are a component of the overall contract between the Owner and the Private Partner. The technical specification is the part of a contract that defines the performance requirements of the project: the functional requirements, the minimum technical requirements for the design and construction, and the scope and level of performance for services. It is the technical foundation of the procurement, delivery and – in a PPP – the operational phases of the contract, and is used to determine compliance at all phases of the project lifecycle.

Figure 3 demonstrates the relationship between the performance requirements and related key components of the contract (normally schedules to the contract) that should be developed in parallel.

Figure 3: Relationship between the output specification and PPP contract



Source: Adapted from the PPP Knowledge Lab 'Designing PPP Contracts'[15]

The requirements within a technical specification typically take two forms: prescriptive or performance.

Figure 4: Types of technical specification requirements

Prescriptive requirement	Performance requirement
Describes or defines, using written specifications and design drawings, **what** needs to be delivered and **how** it is to be delivered. It focuses on solutions rather than expected outcomes or results.	Defines the requirements in terms of measurable outcomes or objectives. The focus is on what needs to be delivered, but **does not detail how** or specific solutions.

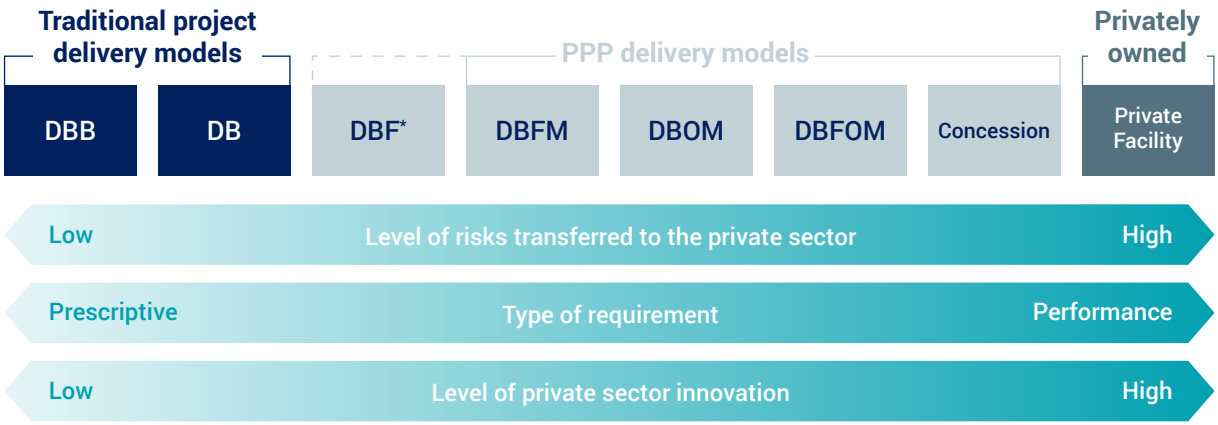
An *output specification* is a form of technical specification that intentionally adopts predominantly **performance requirements** to define the project scope for both the design-construct and operational phases of a project.

15 Available at https://pppknowledgelab.org/guide/sections/61-designing-ppp-contracts

A further defining characteristic of an output specification is the deliberate effort to deeply integrate operation, maintenance and handback performance requirements directly into the technical specifications, rather than aiming to accomplish these objectives *indirectly* through prescriptive design/construct obligations as is typical in traditional delivery models.

The type of specification is one key distinction between projects delivered as a PPP and projects delivered through traditional procurement models. Figure 5 demonstrates the relationship between project delivery models, the level of risks transferred to the private sector and the type of requirements in the specification to achieve innovative solutions.

Figure 5: Relationship between the project delivery model and type of requirements



* In some jurisdictions DBF is considered a PPP, but this is not included in the Reference Guide's PPP definition as it does not have a long-term contract.

Output specifications can also be adopted on design-build (DB) and design-build-finance (DBF) projects, however the level of prescriptiveness tends to be much higher than an output specification on a PPP project. The long-term maintenance risk is retained by the Owner, so prescriptive requirements are typically used to incorporate whole-life decision making into the design, and to manage construction quality risk.

Definitions of technical specifications by the law

In some jurisdictions, the technical specifications have been defined by the "law". The annexe VII of the procurement Directive 2014/24/EU of the European Parliament and the Council of 26 February 2014 on public procurement defined the technical specifications for a public work contract as: "*the totality of the technical prescriptions contained in particular in the procurement documents, defining the characteristics required of a material, product or supply, so that it fulfils the use for which it is intended by the contracting authority; those characteristics include levels of environmental and climate performance, design for all requirements (including accessibility for disabled persons) and conformity assessment, performance, safety or dimensions, including the procedures concerning quality assurance, terminology, symbols, testing and test methods, packaging, marking and labelling, user instructions and production processes and methods at any stage of the life cycle of the works; those characteristics also include rules relating to design and costing, the test, inspection and acceptance conditions for works and methods or techniques of construction and all other technical conditions which the contracting authority is in a position to prescribe, under general or specific regulations, in relation to the finished works and to the materials or parts which they involve (…)*"

5.2 OUTPUT SPECIFICATIONS ON PPP PROJECTS

Given the long-term nature of PPP contracts, the output specification includes both design and construction requirements, as well as lifecycle, maintenance and sometimes operations requirements. The transfer of responsibilities, and therefore risk, over an extended period incentivises the private sector to work in an integrated approach from early in the design to combine maintenance and operation into the design and construction of the project. The integration of both the design and construction and operating period requirements into a single specification suite is intended to promote the Private Partner to develop innovative solutions that minimise whole-life costs of the project.

Although an output specification aims to detail the scope of the project in terms of the desired performance requirements, the reality is an output specification for a PPP remains a balance between performance requirements and prescriptive requirements. Output specifications that are too prescriptive have been shown to dampen innovation and can be precluding to potential private sector partners, while those that are too vague are often associated with assets that do not meet the public sectors' needs or that cannot be effectively and competitively priced during the procurement process. A properly crafted output specification requires striking a balance between:

- having certainty that the procured solution aligns with the vision for the project and meets commitments made (internally and to end users and third parties) during the planning phase (prescriptive requirements); and
- allowing the private sector freedom to generate a value-for-money solution through effective management, team structure, financing and innovation in response to an appropriate risk allocation (performance requirements).

Most of the case studies in this Reference Guide demonstrate output specifications that have a combination of both performance and prescriptive requirements.

Input requirements may be adopted where an owner has an interest in delivering a specific solution to mitigate risk. For example, permit requirements, physical interfaces between new and existing structures, interfaces with third parties, or highly specialised or regulated areas where an owner may have more knowledge than the private sector (e.g. finishes and equipment).

Output requirements would then be developed for all other elements including structural design, mechanical and electrical systems and energy performance where the private sector has more knowledge and can develop innovative, long-term solutions.

The level of prescriptiveness in the output specifications and performance indicators vary across jurisdictions. For example, the Mersin Integrated Health Campus Project (and more generally in Turkish PPP and Latin American PPP projects) are more prescriptive than other European or Canadian PPP projects. The case studies provided demonstrate the range of prescriptiveness currently seen in PPP output specifications.

5.3 STRUCTURE AND CONTENTS OF AN OUTPUT SPECIFICATION

Although the overall contract structure may be similar from project to project, the output specifications should be actively tailored to be project-specific to ensure that key project objectives, functional requirements, minimum technical requirements and performance parameters are detailed to meet the end user requirements and recognise what is affordable within the project budget.

While the structure of output specifications varies across projects and jurisdictions, the typical components would include: 1) functional/development requirements, 2) management requirements required throughout the contract term, 3) design and construction requirements, 4) maintenance, lifecycle and handback requirements, and 5) operations requirements (if the contract transfers operations scope).

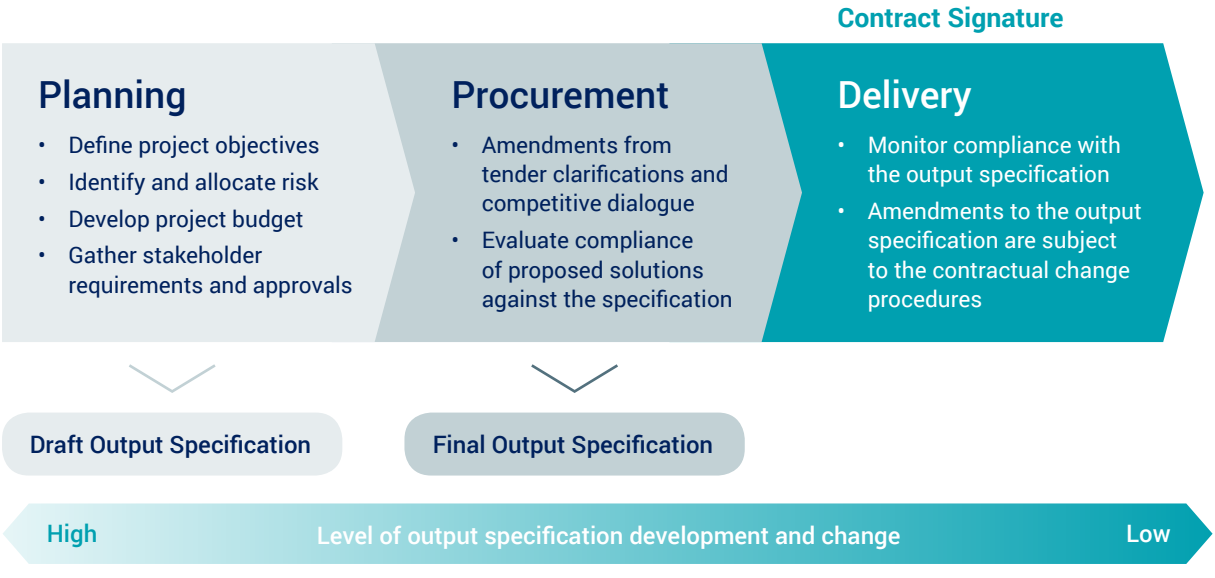
Figure 6: Components of an output specification

Functional/development requirements	• Project description, vision and objectives • Functions, purpose and objectives of the asset • Operational/functional interfaces
Management requirements	• Health and safety, communications, information, risk, quality, and sustainability and environmental requirements
Design and construction requirements	In addition to the design and construction scope, requirements may include: • Phasing, access and scheduling • Management and reporting • Permitting and third party requirements • Commissioning and testing
Maintenance, lifecycle, handback requirements	In addition to the maintenance scope, requirements may include: • Asset condition inspections • Management and reporting • Maintenance planning • Performance measures • Handback process
Operations requirements	The operations scope define the minimum level of service and how service will be measured.

5.4 A PROCESS TO IDENTIFY REQUIREMENTS AND DEVELOP AN OUTPUT SPECIFICATION

The output specifications are drafted by the public contracting authority, often with support from their consultants, during the planning stage of the project. A draft of the output specification forms a core component of the procurement documents and will form the basis for the private sector to develop their technical and financial offer. Throughout the procurement process, the output specification may be amended through private sector clarifications, and it is finalised prior to contract signature as permitted by the terms of procurement process.

Figure 7: Output specification development process



The planning phase is where the requirements are identified and the output specification formed. The amendments to the output specifications during the procurement and delivery phases typically clarify uncertainty and afford flexibility, rather than change core requirements or objectives. Changes following contract signature must be managed through change mechanisms (or variation procedures) within the contract.

The procurement strategy is developed alongside the output specifications and is informed by the project objectives, scope, requirements and risk allocation. An owner may develop response requirements and select proponent evaluation criteria based on the project objectives to promote alignment between the proponent proposals and the project priorities. The aim of the procurement process is to select a project partner that has the skills and experience to not only build an asset that is compliant with the output specification, but also has the skills and experience to effectively deliver the services and manage end user interfaces during the operating period.

Adopting a structured approach to developing project requirements in the planning phase helps facilitate knowledge transfer throughout project delivery and the contract term by clearly documenting both performance priorities and minimum standards, which are informed by the intended outcomes or project objectives. Engaging a range of stakeholder perspectives during the requirement development process helps to mitigate risks from inconsistent end user expectations, complex interface management challenges, and incompatibility between expectation and overall project affordability. Figure 8 outlines a progressive approach to develop requirements.

Figure 8: Requirement development process

It should be anticipated that the eventual Private Partner will aim to propose the solution with the lowest whole-life cost necessary to satisfy the output specification requirements (subject to the weighting of the bid evaluation scoring criteria[16]). When reviewing the output specification in advance of procurement, if the hypothetical lowest cost option does not meet the Owner's, end user's or third-party expectations, the project objectives, or introduces new risks, the requirement should be refined to limit the acceptable solutions. Additional performance criteria should be considered prior to adopting a prescriptive requirement.

As mentioned in Section 5.2, prescriptive requirements have their purpose, and should be used with intent. Prescriptive requirements are valuable, for example, where it is important to manage a critical interface with adjacent infrastructure or operations, a mandatory regulatory or permitting requirement, or a complex stakeholder interface.

A structured requirement development approach also allows the consideration from an early stage of other opportunities to facilitate quality infrastructure outcomes in project delivery, such as building information modelling (or 'BIM').

BIM and beyond – better information, quality outcomes

Building Information Modelling (BIM) brings vast benefits across the lifecycle of an asset from conceptual design optioneering to informed operations. BIM is a process, enabled by technology, that enables the efficient production, sharing and management of digital asset information which leads to improved whole-life performance, cost reduction and better risk management. However, establishing this approach as "business-as-usual" can be challenging, requiring new ways of working, unfamiliar processes and deployment of new technology. Policy makers are increasingly recognising that the value of information as a resource is driving the opportunity for more efficient infrastructure. To achieve this, governments and project procurers are seeking to apply the latest principles and thinking that drive collaboration and openness whilst retaining robust data security. BIM will increasingly become the industry standard and benefit every participant in the process, but its true value will only be achieved if stakeholders develop and follow consistent approaches and use a common language.

BIM adoption has grown in the last decade, particularly in the past five years. Many nations have opted to mandate its use through public procurement mechanisms, strengthening relationships across the many supply chains to drive genuine alignment through information. Challenges have often stemmed from the varied nature and maturity of the parties involved, mutual understanding has been mixed and capability has been fragmented. A focus upon technology has long been perceived as the priority, yet more effort is essential towards the people and process aspects. The advent of a new global standard for information management – ISO 19650 – now provides clearer direction and structure.

There are five steps to successfully realising the benefits of BIM:

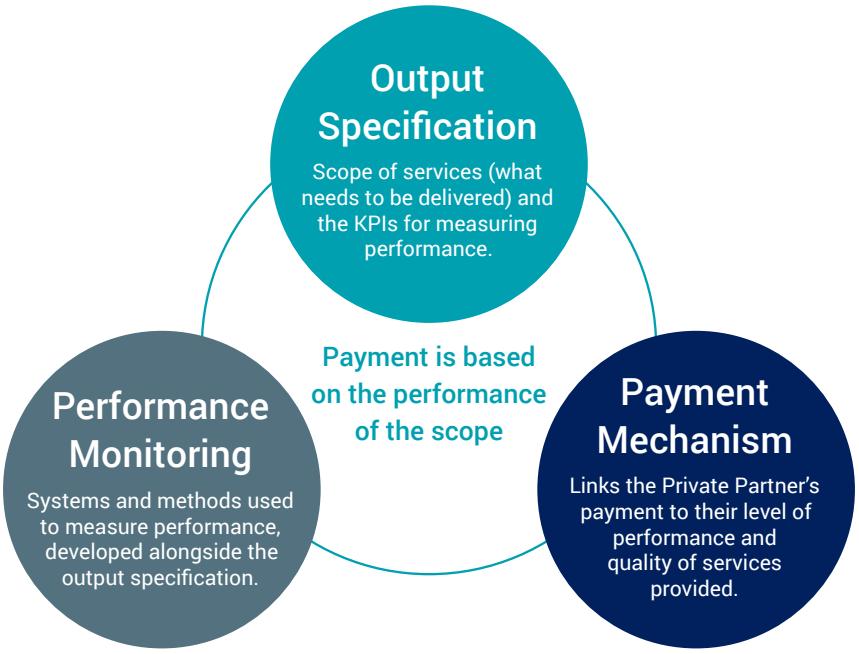
1. **Shape** – informed by overall business plan objectives, a bespoke strategy sets the vision, acknowledges the current position and outlines the actions needed to deliver the change.
2. **Define** – articulate the governance standards and protocols to clearly capture the requirements, putting the strategy into practice across project delivery and asset operations.
3. **Embed** – put the plan into practice through structured pilots, testing and iterating to ascertain an approach that achieves the best fit and results in the biggest impact.
4. **Perform** – operating with a new business-as-usual, building capacity across teams and realising the benefits at scale.
5. **Optimise** – feedback, measure and scale operations further across the enterprise, checking for progress against the goals of the strategy.

16 The bid evaluation scoring criteria can influence the quality of the responses. For example, if the evaluation rewards the lowest price then the quality is likely to be the lowest whole-life cost, compliant solution. However, if the evaluation is more qualitative where the proponents have to provide the best solution within an affordability threshold, or if points for innovation are weighted so they could influence the outcome of the evaluation, then the proponents may provide solutions that exceed the minimum standards.

5.5 THE RELATIONSHIP BETWEEN THE OUTPUT SPECIFICATION, PAYMENT MECHANISM AND PERFORMANCE MONITORING

Performance requirements describe the scope in terms of outputs or performance requirements and should be measurable using objective, quantifiable metrics in order to be enforced through the contract. By defining quantifiable requirements in the output specification, performance can be measured, and objectively linked to payment such that the Private Partner's compensation is commensurate with the quality of the service performed. Figure 9 demonstrates the three components of the contract that should be developed in parallel to implement an effective performance-based contract.

Figure 9: The relationship between the output specification, performance monitoring and payment mechanism



Source: Adapted from the 4Ps Contract Managers Guide[17]

The output specifications should be developed alongside the performance monitoring regime and the payment mechanism to align public sector and Private Partner priorities. When priorities are aligned, the performance monitoring and payment mechanism regimes can reduce the need to prescribe requirements. When developing integrated contract documents the following questions should be considered in parallel:

- **Output Specification:** Is the requirement a priority to deliver a project objective? How does the priority relate to other requirements? What is the impact if the requirement is not achieved?
- **Performance Monitoring:** How and when will compliance be assessed or measured? What evidence is required to assess compliance and monitor performance? What are the contractual mechanisms that can be used to incentivise compliance?
- **Payment Mechanism:** What are the financial deductions or bonuses that will incentivise the Private Partner to meet the output specification requirement? How are they calculated?

Achieving energy performance using performance monitoring and the payment mechanism: Canadian social infrastructure approach

At bid stage, proponents are required to provide an energy consumption target that is considered in the price evaluation.

Energy consumption is measured against the target throughout the operating term.

The costs and savings of energy consumption above or below the target are shared between the Owner and the Private Partner.

Aligned priorities limit the need for specific performance requirements.

17 Available at: http://docplayer.net/9794015-A-guide-to-contract-management-for-pfi-and-ppp-projects.html

For example, the volume and water quality KPIs for the Agadir Mutualized Desalination plant are tracked daily from a remote service station. Any deviation from the production quality and quantity immediately impact revenues. Repeated deviations, both in terms of gravity and of length in time, may lead to warning, and replacement of the Operator if needed (see case study).

In the US Central 70 Managed Lanes project, a Baseline Asset Condition Report formed the basis for maintaining the existing asset during construction and post-construction at a more onerous standard than that applied for the output specification requirements for the operating period to maintain the longevity of the asset (see case study for examples of the requirements in the contract). The performance measures are combined with a payment mechanism that assigns non-conformance points for defects to calculate financial deductions. Non-compliance points are only incurred where the defect is not rectified within the remedy period. There are two classifications of output specification defects which have corresponding defect remedy periods depending on how significant or severe the defect is.

5.6 QUALITIES OF A GOOD OUTPUT SPECIFICATION

There are common qualities of good output specifications. In summary these are:

- **Outcomes focused:** The requirements respond to the project objectives and functional requirements of the asset. The desired outcomes are clearly articulated so the Private Partner understands the end user objectives and their relative priorities.
- **Refer to codes and standards:** Owner, local, national, industry or international codes and standards should be used to specify the minimum level of compliance. Codes and standards should be cited rather than quoted or paraphrased and listed in order of precedence. Exceptions to codes and standards should be clearly articulated in the output specification, including the rationale for the exception. Time should be invested during the planning stage to select codes and standards based on their relevance and the performance they can deliver, rather than listing all potential codes and standards which could limit the possible solutions. In addition to looking at international codes, countries can look at which other national codes from other jurisdictions may be relevant and could offer good practice beyond their existing minimum requirements.
- **Achievable:** Requirements need to be constructible and feasible, and there is at least one solution that can realistically be delivered within the affordability threshold. The requirements, informed by background studies and investigation, recognise the starting position of the project (greenfield versus brownfield), the operational interfaces, and specific project risks. The requirements do not rely solely on "innovation" to solve an intractable challenge.
- **Quantifiable:** Describe the vision, objectives and requirements in a manner that the outputs (project solution) can be measured. Where key performance measures (KPIs) are used, they should be specific, measurable, achievable, realistic and time bound (or 'SMART').
- **Observable compliance:** Where a requirement is not quantifiable, there is a clear understanding of what evidence is required to prove the solution is compliant with a requirement, and how a reasonable agreement between the Owner and Private Partner can be developed. For example, an option would be to define the studies and their methodology that should be completed by the Private Partner to prove compliance, alongside appropriate price adjustment measures.
- **Simple:** Present objective requirements, in simple language, in as few words as possible. Each requirement should focus on a single aspect of the project as compound requirements are more difficult to adjudicate. Requirements should be coordinated across different sections to avoid conflicts within the document.
- **Coordinated:** The output specification is coordinated with other contract documents, including the glossary of definitions. It adopts logical structuring that considers how the output specification will be used to administer the contract throughout the operating term.

Reliance on standards

Industry standards and codes, which vary between locations, are typically used to define the minimum standard. The output specifications are then used to define requirements above standards, or to specify standards from other jurisdictions. The common International Standards (ISO) adopted across asset classes and jurisdictions include:

- **ISO 9001:** Quality management systems
- I**SO 14001:** Environmental management systems
- **ISO 55000:** Asset Management management systems
- **ISO 10002:** Quality management – customer satisfaction
- **ISO 14064 and ISO14065:** Greenhouse gas quantification, validation and verification
- **ISO 19650:** Information management
- **ISO 39001:** Road traffic safety management systems

Some jurisdictions may have their own best practice guidelines on the development of output specifications as demonstrated in the example below from the European Union.

Example: European Union Public Procurement Directive 2014/24/EU 26 February 2014

The following is quoted from Article 42 'Technical specifications':

1. The technical specifications as defined in point 1 of Annex VII shall be set out in the procurement documents. The technical specification shall lay down the characteristics required of a works, service or supply.

   Those characteristics may also refer to the specific process or method of production or provision of the requested works, supplies or services or to a specific process for another stage of its life cycle even where such factors do not form part of their material substance provided that they are linked to the subject-matter of the contract and proportionate to its value and its objectives.

   The technical specifications may also specify whether the transfer of intellectual property rights will be required.

   For all procurement which is intended for use by natural persons, whether general public or staff of the contracting authority, the technical specifications shall, except in duly justified cases, be drawn up so as to take into account accessibility criteria for persons with disabilities or design for all users.

   Where mandatory accessibility requirements are adopted by a legal act of the Union, technical specifications shall, as far as accessibility criteria for persons with disabilities or design for all users are concerned, be defined by reference thereto.

2. Technical specifications shall afford equal access of economic operators to the procurement procedure and shall not have the effect of creating unjustified obstacles to the opening up of public procurement to competition.

3. Without prejudice to mandatory national technical rules, to the extent that they are compatible with Union law, the technical specifications shall be formulated in one of the following ways:

   a. in terms of performance or functional requirements, including environmental characteristics, provided that the parameters are sufficiently precise to allow tenderers to determine the subject-matter of the contract and to allow contracting authorities to award the contract;

continued...

b. by reference to technical specifications and, in order of preference, to national standards transposing European standards, European Technical Assessments, common technical specifications, international standards, other technical reference systems established by the European standardisation bodies or - when any of those do not exist - national standards, national technical approvals or national technical specifications relating to the design, calculation and execution of the works and use of the supplies; each reference shall be accompanied by the words 'or equivalent';

c. in terms of performance or functional requirements as referred to in point (a), with reference to the technical specifications referred to in point (b) as a means of presuming conformity with such performance or functional requirements;

d. by reference to the technical specifications referred to in point (b) for certain characteristics, and by reference to the performance or functional requirements referred to in point (a) for other characteristics.

4. Unless justified by the subject-matter of the contract, technical specifications shall not refer to a specific make or source, or a particular process which characterises the products or services provided by a specific economic operator, or to trade marks, patents, types or a specific origin or production with the effect of favouring or eliminating certain undertakings or certain products. Such reference shall be permitted on an exceptional basis, where a sufficiently precise and intelligible description of the subject-matter of the contract pursuant to paragraph 3 is not possible. Such reference shall be accompanied by the words 'or equivalent'.

5. Where a contracting authority uses the option of referring to the technical specifications referred to in point (b) of paragraph 3, it shall not reject a tender on the grounds that the works, supplies or services tendered for do not comply with the technical specifications to which it has referred, once the tenderer proves in its tender by any appropriate means, including the means of proof referred to in Article 44[18], that the solutions proposed satisfy in an equivalent manner the requirements defined by the technical specifications(…).

18 Article 44 Test reports, certification and other means of proof
Contracting authorities may require that economic operators provide a test report from a conformity assessment body or a certificate issued by such a body as means of proof of conformity with requirements or criteria set out in the technical specifications, the award criteria or the contract performance conditions.

Where contracting authorities require the submission of certificates drawn up by a specific conformity assessment body, certificates from equivalent other conformity assessment bodies shall also be accepted by the contracting authorities.

For the purpose of this paragraph, a conformity assessment body shall be a body that performs conformity assessment activities including calibration, testing, certification and inspection accredited in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council.