

Product Design Specifications

The product design specification (PDS) is a listing of the critical parameters, specifications and requirements for the product you are designing. It is a statement of what the product should be and should do. The PDS is created during the problem definition activity very early in the design process. Much of the product design specification is driven by customer needs. It is intended to show what you are trying to achieve, NOT what you will end up with.

This is a constantly evolving document. It is subject to change as the project progresses and as more information is learned. Detail is added as the design grows.

The following is a list of elements that might appear in a product design specification. It is not intended to be all inclusive.

A. Product design & performance issues...

Expected product quality standards and requirements.

What are the current aspects of quality in competing products?

What are the highest levels of quality we may attain? Are they adequate?

Expected product size and weight

Customer requirements

Constraints imposed on design

Expected product aesthetics -- customer requirement

Expected product ergonomic requirements -- customer requirement

Which user/operator features are desirable in this product?

Are there problem areas for users/operators? Can we design around them?

Expected product performance requirements -- the voice of the customer!

Product shelf life.

Product service life.

Product power requirements.

Performance requirements.

How fast, slow

How often, use cycle

Continuously or discontinuously

Likely loadings (internal/external)

Tolerance of speed

Rate of loading

Expected product reliability standards and requirements.

What level of reliability can we expect for this product?

Expected product safety requirements.

Potential sources of product liability litigation.

Potential operator hazards.

Potential manufacturing and assembly hazards.

Potential for misuse/abuse.

Expected product service environment.

What is the operating temperature range for this product?

What is the operating pressure range?

What is the operating humidity range for this product?

Will product be exposed to dirt or other contaminants (corrosive fluids/gases)?

Is product subject to shock loading?

Will there be any anomalies in power/fuel available for this product?

How will the product be treated in service?

What impact will the product have on its environment?

Will there exist excessive vibration or noise?

Expected product maintenance requirements.

Can product be maintenance-free?

If not, what is expected maintenance cycle?

Is there ease of access to components?

If routine maintenance is required, can it be done by the owner/operator?

Will professional maintenance be required?

Possible off-the-shelf component parts.

Which parts of this product be purchased instead of being made by us?

Is the quality and reliability of purchases parts adequate for this design?

Material requirements..

What are the strength requirements?

What are the rigidity/compliance requirements?

Is product weight of importance?

Expected product recycling potential and expected disposal

Does the disposal of this product constitute an environmental hazard?

Can parts of this product be effectively recycled by existing processes?

Manufacturing process requirements and limitations.

Is protection from the environment necessary?

Is there a customer preference for a particular finish?

How do we minimize environmental impact?

Product packaging requirements.

Can we use environmentally friendly packaging and packing materials?

How much packaging and packing materials are really necessary?

Applicable codes and standards to be checked.

Patents to be checked.

Processes to research/benchmark.

Product part and prototype testing requirements.

B. Market issues...

Potential customer base

Who will buy this product? Why?

Have you listed all potential classes of customers?

Can we tap into a new segment of the market? How?

Market constraints on product.

Who is buying this type product? (customer base)

What is currently selling?

What is currently not selling?

Expected product competition (These will be benchmarked)

If you were a customer, which of the competing products would you buy?

What is the market share of each competing product?

What are the strengths of each competing product? Can we incorporate them?

What are the weaknesses of each competing product? Can we improve?

Target product price -- OEM and MSRP

Target production volume and market share.

Is there a market for this product? How do you know?

Is the potential market sufficiently large to justify investment in a new product?

Is the new product sufficiently better than the competition?

Expected product distribution environment.

How will the packaged product be treated in shipping, storage, and on the shelf?

Are adequate shipping facilities available?

Will installation require a professional?

C. Capability issues....

Company constraints on product design, manufacture, and distribution.

What are our manufacturing capabilities?

Should we manufacture ourselves or outsource?

PRP schedule requirements -- time to market.

When should we have this product to market to capture maximum market share?

How much time should we allocate to design?

How much time do we need to implement a manufacturing process?

PDS Example

(source: Stuart Pugh, *Total Design*, Addison Wesley, 1991)

Surveyor's Pole Stand. A surveyor's pole is used in land surveying for level and distance measurement. It is held vertically at a distance from a measuring device (a theodolite), which is operated by a surveyor. To allow the surveyor to operate independently, a self-supporting surveyor's pole is necessary.

The Product Design Specification (PDS) for the self-supporting pole is as follows:

Performance: To be fixable in position within one minute. Its lower end to contact the ground, even when on irregular terrain. For use on soft or hard ground. The pole to be adjustable for angle so that it stands vertically on slopes up to 1 in 4.

Size: Pole to be 2 m long and showing a "face" of 25 mm. A suitable base size could be X points on a circle not less than 600 mm in diameter. To fit in the trunk of an auto 1 m x 0.5 m x 0.5 m.

Cost: Manufacturing cost plus \$20

Quantity: Batches of 2000 – 5000 for domestic and international markets.

Maintenance: Minimal (e.g., oiling allowed)

Finish: Corrosion resistant to enable continued usage in environment specified.

Materials: Light-weight – transportable – not easily damaged by impact.

Weight: Five kilograms maximum.

Aesthetics: Must present an image of robustness, reliability, and compactness.

Product life: Twenty years.

Customer: Surveyors in government and private sectors, domestic and international.

Standards/specifications: To be checked.

Politics: Not applicable.

Life in service: Five years

Reliability: Maximum 3% failure rate over service life.

Safety: Should not have sharp projections; should be capable of being set up with gloved hands.

Environment: Temperature range -20°C to 100°C; resistant to water, salt, dust, wind, ice, rocks, common solvents, oil, gasoline and the like; shock proof to 10 g; wind speeds up to 25 mph.

Shelf life: Five years.

Packing: Standard pallets to appropriate ISO standards.

Time-scale: Production to start nine months from specification date.

Testing: Prototypes to be proven to meet PDS. No testing of production models (except for sampling).

Ergonomics: Must be convenient to handle and store, easy to set up and dismantle, and be capable of set up by one person.

Competition: To be analyzed.

Market: Worldwide. Trends to be analyzed.

Patents: To be checked.

Manufacturing facility: Adequate capacity and suitable tools available.

Company constraints: None at this stage.

Processes: Batch production.