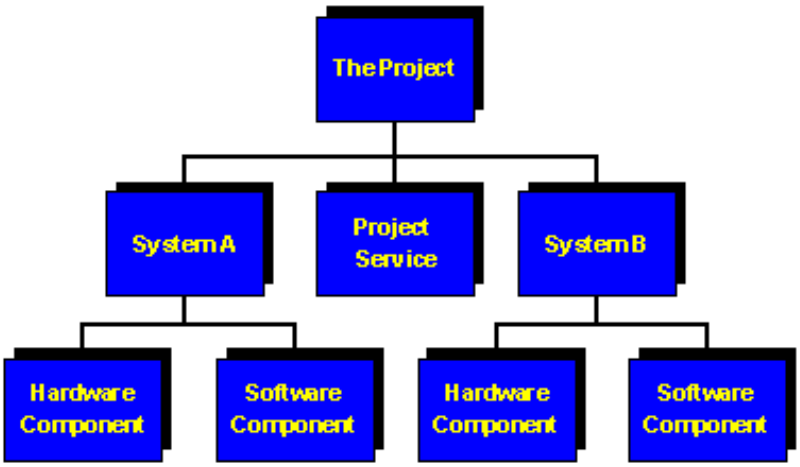
Work Breakdown Structures

The WBS[1] is a hierarchal decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables[2]. The WBS should be structured in accordance with the way work will be performed and reflect the way in which project's cost and schedule data will be summarised and reported. The WBS is one of many different types of 'breakdown structure' used in project management[3].



The most common structure for a WBS is a 4 to 6 level indented structure, where the first three are managerial levels describing (for example) the total project, the project phases and the control accounts. The lower level(s) are technical levels culminating in the work packages.

Where a component of work is to be outsourced to a separate contractor, the project's WBS stops at the control account or work package level that describes the contracted work. Lower level detail should be incorporated in a WBS maintained by the contractor.

WBS Nomenclature:

- **WBS element:** Any single component in the WBS diagram – the component can be at any level. Types of component include:
  - **Parent:** A higher level element in the WBS that is decomposed into two or more lower level elements (children)
  - **Child:** A lower level element in the WBS that is rolled up into a single higher level element (parent). Parent/Child descriptions are relative; an element can be both a parent of lower level elements and the child of a higher level element.

---

[1] The concept of work breakdown structure developed as part of the Program Evaluation and Review Technique (PERT) by the United States Department of Defense (DoD). While the term "work breakdown structure" was not used, PERT organised the activities into product-oriented categories.

By June 1962, DoD, NASA and the aerospace industry published PERT/COST System Design, which described the WBS approach. This guide was endorsed by the Secretary of Defense for adoption by all services. On the 1st November 1968, the DoD issued "Work Breakdown Structures for Defense Materiel Items" (MIL-STD-881), a military standard requiring the use of work breakdown structures across the DoD. This standard has been revised several times, most recently in 2011.

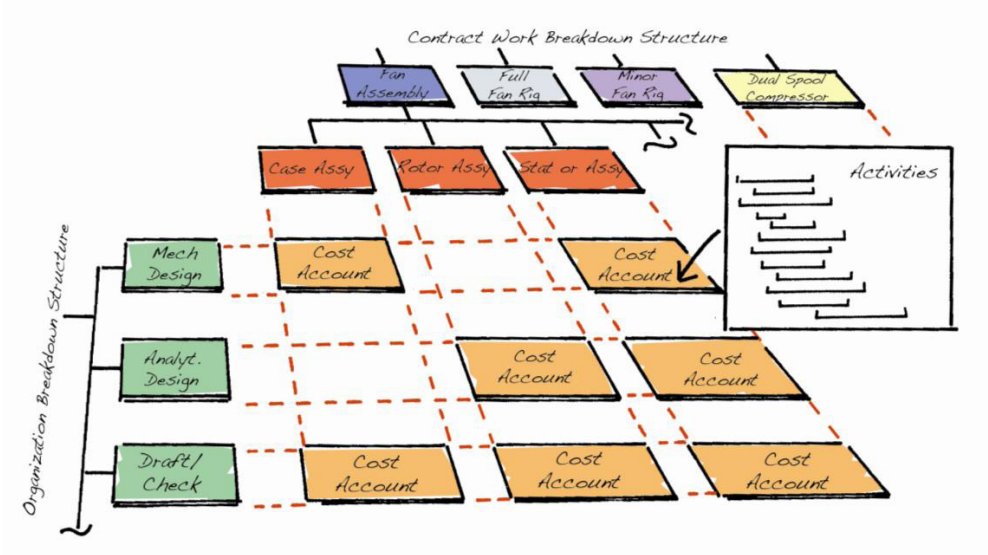
[2] PRINCE2 uses the concept of Product Breakdown Structure (PBS). Whilst the deliverables that make up the final product to be delivered to the client are always the major part of any WBS, the PMI definition ensures there is no possibility of missing any of the work required to be accomplished by the project team including project management activities, safety functions, etc.

Modern PRINCE2 practice has been to extend the concept of 'product' to include all of the outputs from a project including internal reports, etc. so in effectively there is very little difference between a WBS and a PBS. However, for the purposes of PMI examinations assume the terms 'total scope of work' and 'deliverables' encompass more than just the 'product'; or to put it another way, the 'product' is only part of the 'total scope of work'. For more on the difference between PBS and WBS see: http://www.mosaicprojects.com.au/Mag_Articles/P028_PBS-v-WBS.pdf

[3] For more on **project breakdown structures** see: http://www.mosaicprojects.com.au/Mag_Articles/P009_Breakdown_Structures.pdf

First published 12th June 2010 – augmented and updated.

- **Work Package:** the lowest level of any branch of the WBS. The work package is a defined section of project work that produces a deliverable (either a part of the product or something required for the management of the project such as a risk management plan). The Work Package should be at a level of detail appropriate for the project, small enough to allow effective planning, management and control of the work required to accomplish the scope included in the package. The work package is normally the point of integration for schedule, cost, quality, and risk information and should be at a level of detail that allows:
  - Adequate cost and duration estimates to be developed
  - It is manageable through the assignment of responsibility and authority - level of delegation
  - It is able to be integrated and measured - the whole package can be seen
  - It is autonomous and unambiguous
  - What is initially an 'adequate' level of detail can change as the project develops and more information becomes available (progressive elaboration).
- **Planning Package:** the lowest level of any branch of the WBS where that branch is expected to be decomposed into greater detail at a later date; generally when either time allows, or more information becomes available. The Planning Package covers a defined scope of work and acts as a 'temporary holder' of the estimated time, cost and other factors needed to accomplish the scope. Until the Planning Package is broken down into smaller components, the scope covered by the Planning Package is represented in the schedule, cost and other affected plans as a high level 'summary' entry. Planning Packages must be broken down into work packages (or converted into a work package) and the schedule, cost and any other affected plans updated before work commences on that part of the scope.



- **Control Account (or Cost Account):** A management control point where the integration of scope, budget, actual cost, and schedule takes place, and where the measurement of performance will occur. Control accounts (CA) are placed at selected points (specific components at selected levels) of the WBS. Each CA may include one or more work packages, but each work package may be associated with only one CA. Each CA is associated with a specific organisational component (person) in the OBS[4]. The responsible manager is frequently designated as the Cost/Control

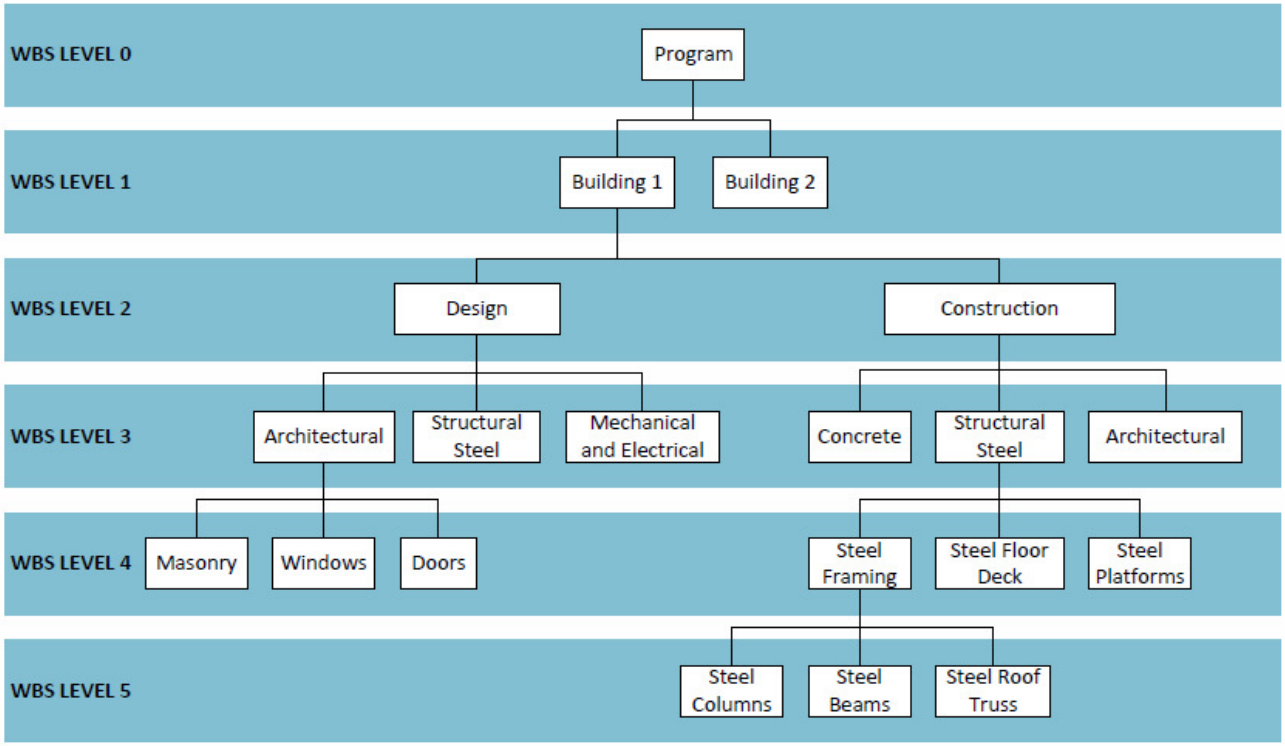
[4] OBS = ***Organisational Breakdown Structure*** – the staff reporting relationships within the project. The intersection of WBS and OBS may be a control account or a work package. It defines the point of management responsibility for a deliverable or a series of deliverables.

Account Manager or CAM.

- **WBS dictionary:** The Work Breakdown Structure Dictionary is a companion document to the work breakdown structure (WBS) that describes each WBS element. It can be in any practical format, but for large projects a database is normal. For each WBS element, the WBS Dictionary includes a statement of work and a list of associated activities and milestones. Other information may be included: responsible organization, start and end dates, resources required, an estimate of cost, charge number, contract information, quality requirements, and technical references to facilitate performance of the work. It is important that the WBS dictionary provides concise, relevant, and sufficient information in the same format for every element. The WBS dictionary will generally include:
    - The code of accounts number (WBS number)
    - The description of the element
    - Exactly what will be done (referencing the specification, etc)
    - What is required to allow the work package to start
    - Associated activities, and milestones (referenced to the schedule)
    - Any assumptions or identified risks
    - Who is responsible for performing the work (person or organisation, may be internal or external)
    - Who is responsible for managing the work (must be a manager working for the project manager)
    - What are the deliverables
    - Who will receive the deliverables
    - The estimated duration, resources and cost for the work package
    - How progress will be measured

WBS Code	WBS Element Description	Date	Revision
00.01.01	**Phase 1 – Site Preparation**	**2/15/2015**	**1**
WBS Element Description			
Work product: This shall include the initial clearing, grubbing, mass excavation, and rough grading of the site per specifications. *Relationships:* Dependent on obtaining site permits. *Risk Factors:* Unknown underground conditions (boulders, utilities). *Assumptions:* Will be constructed on a 5 day 40 hour workweek. *Specifications:* Civil specification 31.10.00			

- **WBS Levels:** Establish the hierarchical structure of the work breakdown structure. Typically the highest level of the WBS is identified as level 0. The level typically forms the first part of the WBS element number:



Guidelines for developing a WBS:

A well designed WBS has the following characteristics:

- **Clear direction/definition:** Make sure the project initiation has been fully completed and the parameters of what's in and what's out of scope agreed before developing the WBS.
- **Completeness:** The WBS should describe all of the work needed to complete the whole project. And there shouldn't be anything in the WBS that isn't part of the project.
- **The 100% Rule:** The highest two levels of the WBS should include 100% of the work of the project and only the work needed to complete the authorised scope. When documenting lower level elements (children) underneath a WBS element (parent), the children must completely and exactly describe the same amount of work as the parent (100%), just in more detail.
- **Appropriate level of detail:** Only develop the WBS to an appropriate level of detail—one that provides adequate information to plan, manage and control the project without creating excessive data.
- **The decomposition Rule:** Each element of the WBS decomposes into at least two 'children' (if no further decomposition is needed (or possible) do not go to the next level for this branch of the WBS). Each 'child' has only one parent (a WBS element must not be connected to 2 higher level elements).
- **Change Control:** Processes need to be developed to manage, and retain an audit trail of, the following changes:
    - Between different branches of the WBS - (scope and budget deleted must equal scope and budget added, this includes transfers from contingency elements to work packages affected by a risk event)
    - Between the WBS and management reserves held outside of the WBS (the WBS should include internal contingencies available to the project team and rules for their use).
    - Between the WBS and the external 'client' where changes to scope (additions or deletions) are authorised through the project change control system.

Links to the Schedule[5]:

The activities in the project schedule follow the 100% rule. Each work package or planning package should decompose into one or more schedule activities. Planning packages are typically represented by a single summary activity (eg, Allowance for testing = 8 weeks); this summary activity will be replaced by more detailed activities once the full requirements of the work are defined[6]. Normal work packages typically expand into a significant number of activities and milestones that fully define the sequence and duration of the work needed to complete the package. The activities should define 100% of the effort needed to accomplish the work package. Each schedule activity should only roll up into a single WBS element.

Links to Earned Value Management[7]:

Most EV systems aggregate/integrate information at either the work package level or the control account level. This level of granularity balances the effort needed to identify and allocate actual cost data with the usefulness of the information provided. In most organisations accurately dividing and allocating actual costs to the schedule activity level is nearly impossible whereas rolling up schedule progress data to a work package is straightforward.

The Earned Value methodology involves more then just calculating formulae. Where a variance is identified, the responsible manager is expected to assess the reason and recommend recovery actions. This requires a single point of management responsibility for each work package and control account.

More information:

- ***Practice Standard for Work Breakdown Structures*** 2nd Edition – www.pmi.org
  (available as a free PDF download for members – see next page)
- Other WBS Standards:
  - MIL-STD-881C (3 Oct 2011), Department of Defense Standard Practice, Work Breakdown Structures for Defense Material Items
  - ASTM E2150 - 13 Standard Classification for Life-Cycle Environmental Work Elements—Environmental Cost Element Structure
  - ASTM E2103 / E2103M – 13, Standard Classification for Bridge Elements—UNIFORMAT II
  - ASTM E1557 - 09(2015) Standard Classification for Building Elements and Related Sitework—UNIFORMAT II
    Plus other ASTM Standards

[5] For more on ***scheduling*** see: http://www.mosaicprojects.com.au/PMP_Sup/PMP_Mod06_Time.html

[6] See ***'rolling wave planning'***: http://www.mosaicprojects.com.au/WhitePapers/WP1060_Rolling_Wave.pdf

[7] For more on ***Earned Value*** see: http://www.mosaicprojects.com.au/WhitePapers/WP1081_Earned_Value.pdf

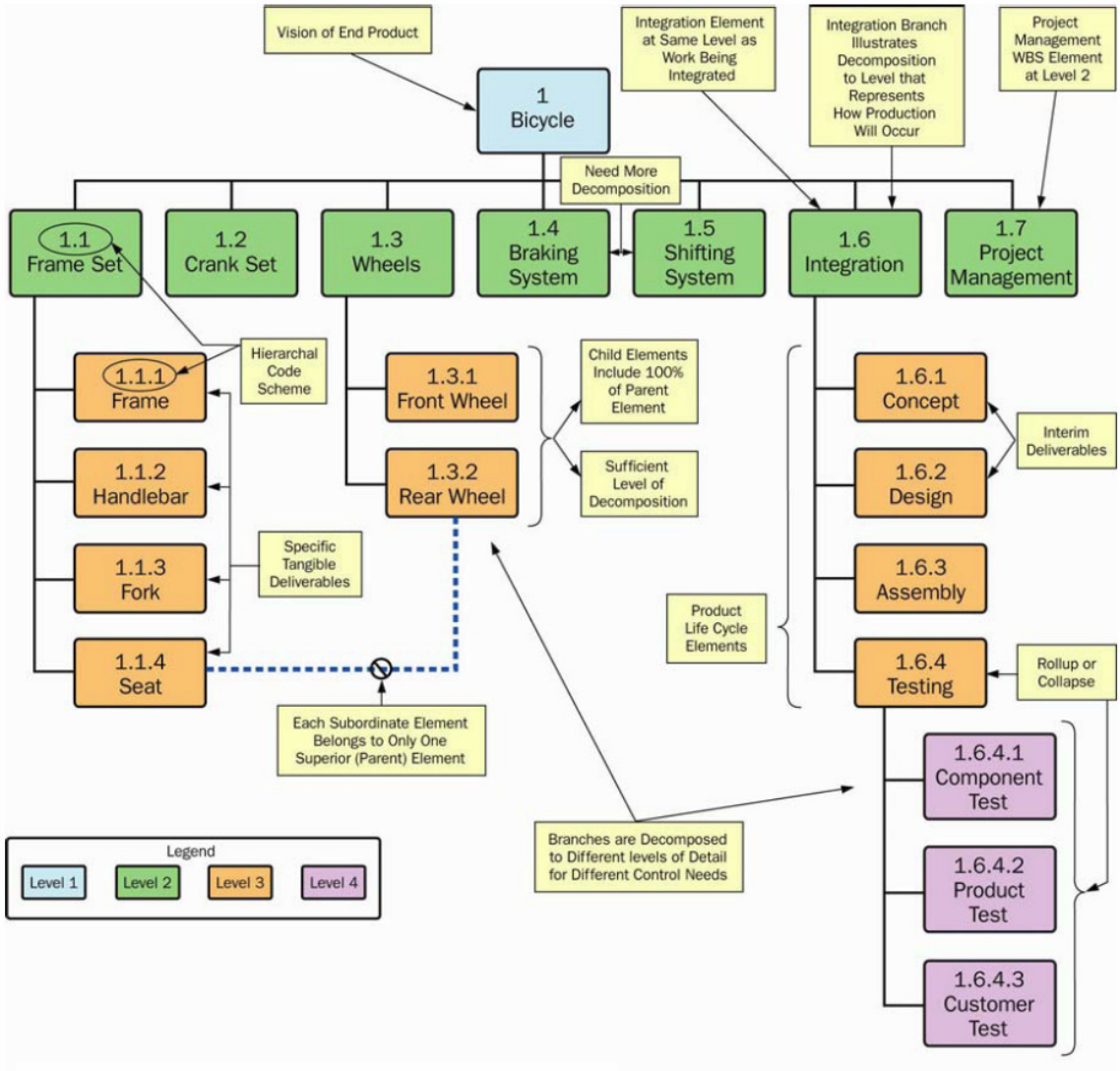


Diagram above © PMI from the WBS Practice Standard.

- For a discussion on the ***other types of project breakdown structures*** including CBS, RBS, BoM and others see: http://www.mosaicprojects.com.au/Mag_Articles/P009_Breakdown_Structures.pdf

---

This White Paper is part of Mosaic's ***Project Knowledge Index***
to view and download a wide range of published papers and articles see:
http://www.mosaicprojects.com.au/PM-Knowledge_Index.html