

What is a Material Take Off in Construction / Engineering?



Before a vendor can bid for or begin a construction project, they have to know the types and quantities of the various materials required to complete it.

This is to ensure a proper estimate of the costs and material requirements, and also to provide an indication of the labor costs associated with the installation or construction of the materials.

This process is known as material take off (MTO), construction takeoff, or simply as takeoff. It's an essential part of a project estimation process.

For smaller projects, experienced builders should be able to compile a material estimate in their head, but a more complete process is necessary for major projects. One must approach the task methodically to achieve the most accurate estimate possible.

In addition to providing a highly accurate estimate of the costs and materials for yourself and your client, the MTO sheet helps the job run smoother because all the people working on the project have what they need.

While a solid takeoff improves your cost estimates, other factors must be considered, as well, including your overhead costs, changes to market prices

for raw materials, and any additional various expenses.

What To Include on a Takeoff Document

The material takeoff document must have a list of all the materials required to complete the project, no matter what it is.

This does not include any assets, such as equipment and tools that will also be required to complete the job but should include any and all raw and prefabricated tools, such as timber, sand, concrete, bricks, electrical cables, light fixtures, and plumbing pipes.

After listing the building materials, the MTO needs to specify the type of material, such as the type of electrical cable or specific grades of steel.

Key Types of Measurement Required in Takeoffs for Most Projects

• Count

You must count everything required for individual items from the studs required to complete the project to the number of light fixtures and faucets.

• Length

Certain items, such as pipes and cables, are measured by length. You'll also need to know other dimensions, like diameter, but the information will be with the type of material that's required.

You'll need to know how many of each length you'll require, and you'll need to allot extra length for elements such as switches, panels, and receptacles when it comes to electrical cable.

• **Area**

Certain elements, such as flooring or the amount of paint you need will require the surface area measurement.

• **Volume**

Measurements of volume will be required for certain materials, such as the amount of concrete required to lay the foundation, or the asphalt per yard to pour the parking lot outside the building.

Types of Material Takeoffs

• **Manual Takeoffs**

This type makes use of traditional paper blueprints and plans. For this to work, the estimator needs to be able to accurately read the materials for the type of work quantified, whether it's general architectural drawings, an electrical schematic, a plumbing schematic, or something else.

In addition to the diagrammatic representation of the project, the documents will contain symbols and notes that may indicate the type of required materials.

Work from these plans with colored pens, pencils, or markers so you can distinguish between all the items and types of materials. You can transfer the materials and quantities to spreadsheets or forms and worksheets you can use to work out the exact material costs for each component.

Because paper blueprints can be pricey to produce, you may be required to use a clear plastic overlay instead of marking directly on the blueprint. As such, many estimators are making use of new technology to perform estimates digitally.

In the case of engineering projects, you may not be using blueprints, but a design document.

• Digital Takeoffs

It's possible to use manual takeoffs to get an accurate estimate, but they can be labor intensive and complex. It can also cause errors if you get a measurement, calculation, or count wrong.

As more companies are producing digital blueprints, and there is available software to partially automate and streamline the takeoff process, many estimators are opting for a digital takeoff instead.

Though there are different specifications for the different software applications, all of them allow you to analyze a set of blueprints and enter the measurements and quantities. Some systems integrate with a quotation or bidding program so you can easily combine the two processes.

The Takeoff Process

The exact details of the process will vary depending on a variety of factors, including the software you're using, the type of job, the scale of the job, and your specialization as a mechanical, electrical, and plumbing engineering (MEP) estimator.

While there will be slight differences in drawings and specifications, the general process remains the same regardless.

1. Count the Symbols

You must count the symbols to determine the number of components needed to complete the job. The drawings and blueprints you're working from will use standardized symbols to identify various elements such as switches, receptacles, and fixtures.

Familiarize yourself with the symbols and what they mean. Non-standard components are generally identified with a key that's included with the drawings.

Count each type of component individually. If you're doing this manually,

you can use a tally counter that you click to add a unit.

Though it helps to ensure accuracy, it can be time-consuming and tedious. You'll need to mark the symbols somehow to indicate that you've counted it, so you don't count it again.

As you complete the count for a component, enter the quantity on the working scope sheet, and repeat until you'll worked through all pages of the blueprint and all the symbols. Then, add the totals for all the different components.

2. **Measure the Circuits**

You must also measure the circuits shown in the drawings. Before you begin, check the scale used for all the pages you measure. The scale dimensions are usually listed in the title of the drawing, but the scale may vary from page to page.

If you're not working from original blueprints, they may have been copied at a reduced size, so you must make sure the scale is accurate.

If you doubt the information in front of you, it's best to contact the designers or architect to be sure.

You'll want to have an architectural rule, mechanical and electronic measuring wheels, and scaled measuring tapes available. You can use the ruler and measuring tapes for quick measurements in small dimensions but using the measuring wheel is both accurate and convenient.

Measure the branch circuit for each component in the drawing and allow and add in drops at each of the switches.

Some wheel devices allow you to program a set distance for drops and then press a key to add the distance. If the drops are standardized, this works, but if they are different sizes, you'll need to reset it each time.

It's possible there will be different circuits (two, three, or four-wire) on the same drawing.

Trace each circuit with a colored pen after you've finished measuring and

use the same color for the same type of circuit – such as red for two wire, green for three wire, and blue for four wire.

3. **Calculate the Takeoff**

Using the counts and measurements you came up with in the two previous steps, you can produce your takeoff figure. You should build in a small cushion for price fluctuations, and with this you can provide a fairly accurate cost of the materials involved in any given construction or engineering project.

If you have the right time and motion data, you can also estimate the scale of the job to project labor costs and other expenses associated with the project.

The MTO is used to create the bill of materials (BOM) which is then used to requisition and procure the necessary materials to complete the job once the contract is awarded.

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