

Blueprint Reading & Estimating for Commercial Projects



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Presenter




Michael J. McDavid

Disclaimer




This presentation is not intended to be a comprehensive program covering all aspects of this topic. All technicians are encouraged to read and follow all applicable standards, codes and regulations related to this topic.

- ✓ It is the responsibility of each individual contractor to follow local building codes and licensing requirements and to work safely in accordance with OSHA guidelines.
- ✓ It is the contractor's responsibility to take proper precautions on each project to prevent cross contamination. Always take the health and safety of the building occupants into consideration before you conduct any cleaning procedures.
- ✓ All of the following tips are only general tips. They do not cover every situation and it is your responsibility to adapt these tips to the individual system you are working on.
- ✓ The Instructor is not responsible in any way for the work you perform after viewing this slide show. You are responsible for your own work.
- ✓ The views and opinions following are the instructors opinions and not necessarily the official position of the National Air Duct Cleaners Association.




What We'll Learn


- Introduction to Blueprints
- Blueprint Reading
- Estimating Projects
- Exercise



Building Types

- Residential
- Light Commercial
- Commercial
- Industrial
- Institutional







Background on Architectural Drawings

Architecture is both the process and product of planning, designing and construction.

An Architectural drawing is a technical drawing of a building (or building project) that falls within the definition of architecture








Background on Architectural Drawings

Architectural drawings are used by architects and others for a number of purposes:

- To develop a design idea into a coherent proposal
- To communicate ideas and concepts
- To convince clients of the merits of a design
- To enable a building contractor to construct it
- As a record of the completed work
- To make a record of a building that already exists: As Built (as it was actually built)
- In Order to create commercial proposals you need to understand key areas within Architectural Drawing


- With no written scope of work your company will be required to conduct a great deal of extra work and you are taking a significant risk financially. If the customer states that no scope of work exists then you should recommend the NADCA Specification.....
- You should make every attempt early on to get the customer to sign off on the scope before generating a proposal because the rest of the contractors will be creating their prices from faulty information and up selling the customer once they get on the project.
- In order to create an competitive proposal all bidding contractors need to be quoting from the facilities Architectural Blueprints



Background on Architectural Drawings

Standard views used in architectural drawing

1. Floor plan
2. Site plan
3. Elevation
4. Cross section
5. Isometric and axonometric
6. Detail drawings



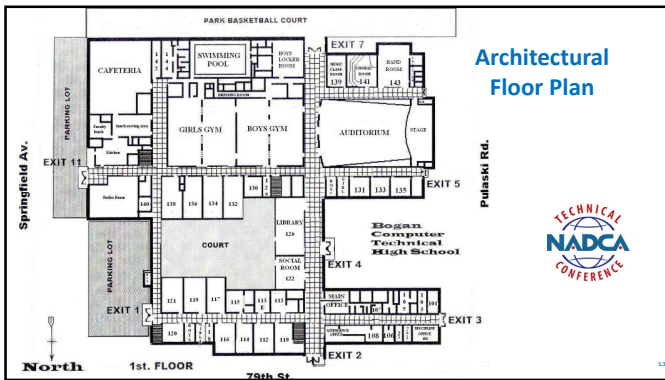
Background on Architectural Drawings

Standard views used in architectural drawing :

- 1. Floor plan
- 2. Site plan
- 3. Elevation
- 4. Cross section
- 5. Isometric and axonometric projections
- 6. Detail drawings



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Architectural Floor Plan



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Background on Architectural Drawings

Standard views used in architectural drawing:

- 1. Floor plan
- 2. Site plan
- 3. Elevation
- 4. Cross section
- 5. Isometric and axonometric projections
- 6. Detail drawings



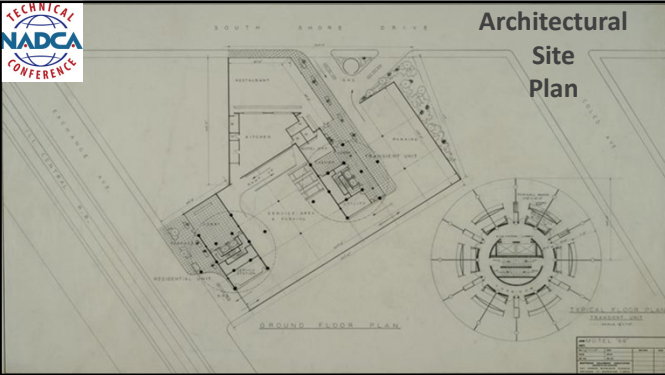
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Architectural
Site
Plan




13




Architectural
Site
Plan



14



Architectural
Site
Plan




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Background on Architectural Drawings

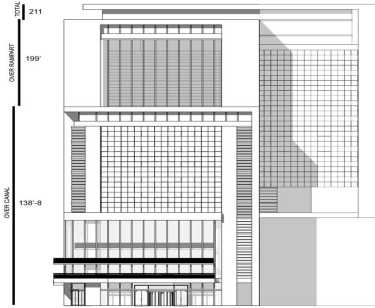
Standard views used in architectural drawing:

1. Floor plan
2. Site plan
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6. Detail drawings



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Elevation Drawing




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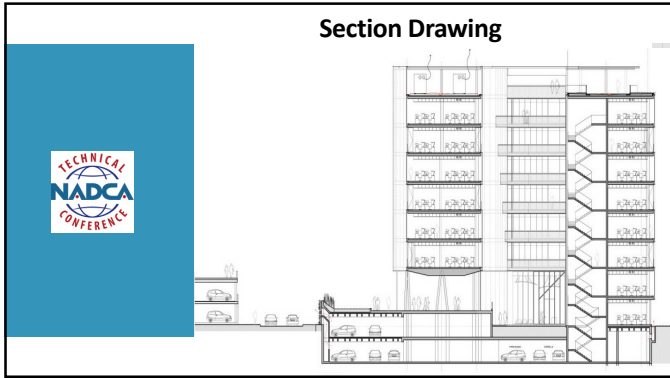
Background on Architectural Drawings

Standard views used in architectural drawing:

1. Floor plan
2. Site plan
3. Elevation
4. Cross section
5. Isometric and axonometric projections
6. Detail drawings



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Background on Architectural Drawings

Standard views used in architectural drawing:

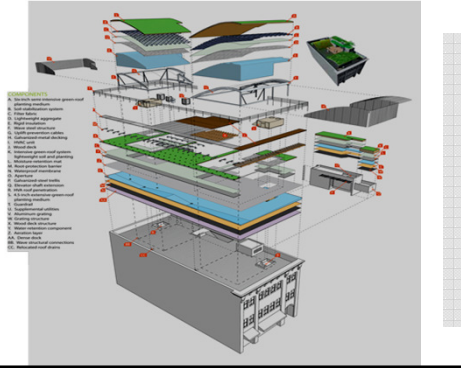
1. Floor plan
2. Site plan
3. Elevation
4. Cross section
5. Isometric and axonometric projections
6. Detail drawings

The image is a slide with a blue background on the left and a grey grid background on the right. The NADCA logo is positioned on the grid. The text on the blue background lists standard architectural views.

Isometric Drawings

The image shows several isometric drawings of various geometric shapes, including cubes, rectangular prisms, and more complex forms. To the right, there is a 3D perspective drawing of a cube on a blue grid. Red arrows indicate dimensions: one arrow shows a height of 35.264, and another shows a width of 45.

Axonometric Building Drawing

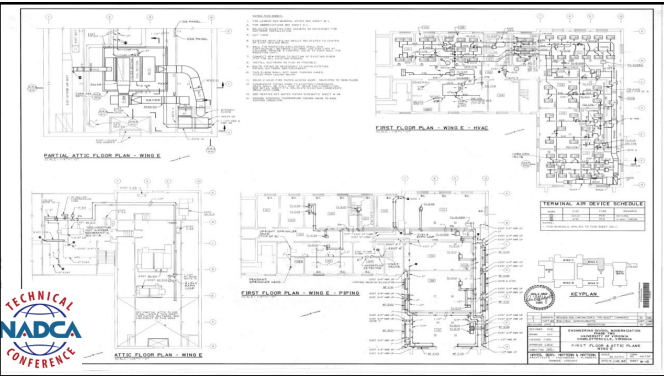


Understanding Mechanical Drawings



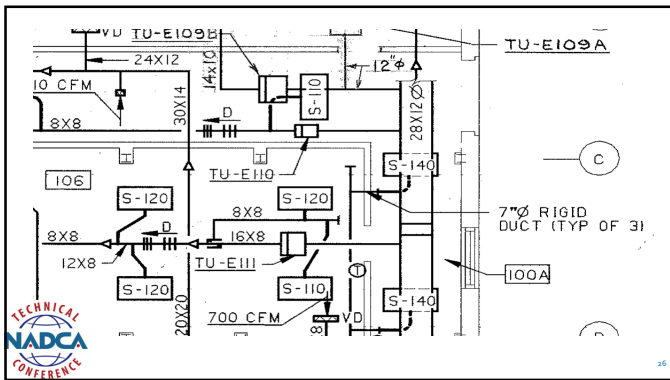
AS BUILT
4-15-65

MECH. EQUIP. ROOM			JOB NO.	
PENT HOUSE			6333	
SCALE: 1/4" = 1'-0"	CH'K'D.	DRAWN	ISSUED	SH. NO.
DATE: 10/10/65	H.C.Y.	R.P.H.	H.A.M.	M-25



Mechanical Symbols

(WALL)		HUMIDISTAT
(CEILING)		
		SUPPLY AIR
		RETURN AIR
		EXHAUST AIR
		DUCT WIDTH (OR VISIBLE SIDE) AND DEPTH
		DUCT DIAMETER



Mechanical Symbols

	SUPPLY AIR DUCT SECTION
	RETURN OR EXHAUST AIR DUCT SECTION
	OUTSIDE AIR DUCT SECTION

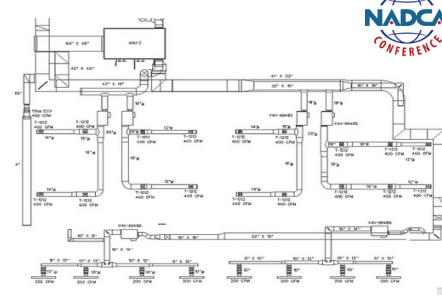
HVAC System Inspection and Site Preparations


Mechanical Drawings:


Review Mechanical Drawing

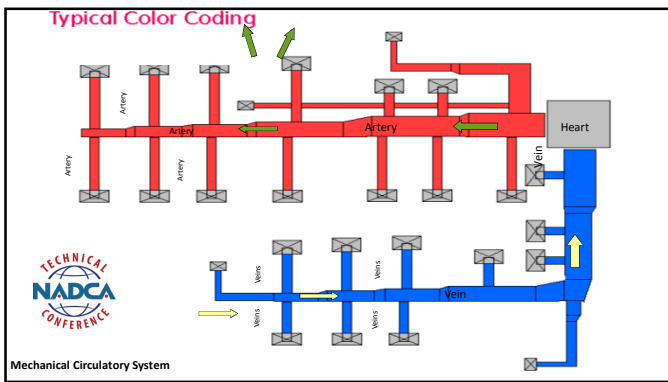
A. Blueprint Symbols & Reference


B. Definitions











Estimating the Project

General Notes Where do we find them?

Front page of mechanical drawings

On each separate mechanical page

Can the notes be page specific?

Keyed Notes

Used to call out specific tasks

Most of the time they are page specific

Understanding Mechanical Drawings

KEY PLAN

NOTES - THIS SHEET:

- FOR LEGEND AND GENERAL NOTES SEE SHEET W-1.
- FOR ABREVIATIONS SEE SHEET D-1.
- RELOCATE EXISTING PIPE HANDERS AS NECESSARY FOR ACCESS TO CLEAN OUT.
- NOT USED.
- EXISTING 2" DIA. 150 PSI WELLS RELIATED TO CENTER LINE OF BUILDING DO NOT CROSS OVER THIS WORK. EXISTING WELLS TO BE PROTECTED WITH 1/2" DIA. WALL FOR PROTECTIVE COVER.
- REMOVE NEW PRINT TO BOTTOM OF EXISTING RISER TRIP FOR ALL EXISTING RISERS.
- INSTALL DOOR TRIM AS HIGH AS POSSIBLE.
- PROVIDE INSULATION AS NECESSARY FOR EXISTING PIPEL, DO HAND AND EQUIPMENT.
- THIS IS ROOM SHALL NOT HAVE TURNING VANES. ACCESS FROM CEILING BOUND.
- SEKO 2 HOUR FIRE RATED ACCESS DOOR, RELUCATED TO THIRD FLOOR.
- CONDENSATE PIPING DOWN TO EXISTING CONDENSATE DRAIN TRAP, DRAIN TO TRAP, TRAP TO EXISTING CONDENSATE DRAIN INTO CURB.
- SEE MECHANICAL HOT WATER PIPING SCHEMATIC SHEET W-14.
- PROVIDE AUTOMATIC TEMPERATURE CONTROL VALVE TO EACH OUTSIDE CONNECTION.

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UNIVERSITY OF VIRGINIA
MC-CORMICK ROAD
CHARLOTTESVILLE, VIRGINIA 22904


MECH EQUIP ROOM
PENTHOUSE
0333
M25

Specifications





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Commercial HVAC System Cleaning Recommendations and Requirements



- 1. Scope of Work**
 - (A) Identifying Specified Scope of Work
- 2. HVAC System Inspections & Site Preparations**
 - (A) Mechanical Drawings
 - (B) HVAC System Site Evaluation
 - (C) Pre-existing System Damage Considerations
 - (D) Site Evaluation and Preparations

Commercial HVAC System Cleaning Recommendations and Requirements



- 3. General HVAC System Cleaning Requirements**
 - (A) Containment Requirements
 - (B) Particulate Collection Equipment
 - (C) Controlling Odors During Cleaning
 - (D) Component Cleaning
 - (E) Air-Volume Control Devices
 - (F) Service Openings, Do's and Don'ts
 - (G) Ceiling Types and Considerations
 - (H) Air distribution devices (registers, grilles & diffusers)
 - (I) Air handling units, terminal units, blowers and exhaust fans
 - (J) Duct Systems Identification and Cleaning Requirements




Commercial HVAC System Cleaning Recommendations and Requirements

4. Health and Safety

- (A) Safety Standards
- (B) Occupant Safety During Cleaning
- (C) Disposal of Debris after Cleaning

5. Mechanical Cleaning Methodology

- (A) Source Removal Cleaning Methods, Tools and Equipment
- (B) Methods of Cleaning Fibrous Glass Insulated Components
- (C) Damaged Fibrous Glass Material Repair or Replacement
- (D) Cleaning of coils
- (E) Cleaning Agents and Coatings




Commercial HVAC System Cleaning Recommendations and Requirements

6. Cleanliness Verification

- (A) General Types to Cleanliness Inspections
- (B) Visual Inspection
- (C) Verification of Coil Cleaning

7. Post-project Report and Documentation

8. Applicable Standards and Publications




Scope of Work Example

The relining of the units-specify Armacell liner. This is done in the blower section of the AHU. Seal coat liner in filter section.

- 1.) AHU, A-1
 - Clean AHU, Low pressure duct from the VAV's to grill
 - High pressure supply and return duct system
 - VAV boxes
 - Clean AHU coils
- 2.) AHU, A-4
 - Clean/reline AHU Remove the possible molded liner from the blower section of the AHU unit reline using Armacell Liner
 - Clean Supply and return duct system
 - Clean AHU coils
 - Seal coat liner in filter section.
- 3.) AHU, A-5
 - Remove the possible molded liner from the blower section of the AHU unit reline using Armacell Liner
 - Clean AHU coils
 - Seal coat liner in filter section.
- 4.) AHU, B-2,3,4
 - Clean AHU's, supply and return duct system
 - Clean AHU coils

Scope of Work (Cont.)




- 5.) AHU, C-2
 - Clean AHU, supply and return duct system
 - Clean AHU coils
- 6.) AHU, E-1
 - Clean/reline AHU Remove the possible molded liner from the blower section of the AHU unit reline using Armacell Liner
 - Clean AHU coils
 - Seal coat liner in filter section.
 - Clean low pressure duct from VAV to grills
- 7.) AHU, E-14,15
 - Clean AHU's Supply and return duct system
 - Clean AHU coils
- 8.) AHU, D-1
 - Clean AHU, Paint outside of supply air duct using Fosters 40-20
 - Clean AHU coils
 - Clean the supply and return duct system

All work needs to be done as per the National Air Ducts Cleaners Association specification and standards and supervised by a Certified Air Systems Cleaning Specialist.

Specifications


Where do we find the HVAC Cleaning?



1. Division 15 (New Format Coming)
2. Duct section
3. Separate section for HVAC Cleaning
4. Keyed notes
5. General notes
6. Other sections can refer to your scope of work
7. Addendums

When We Have Questions



It's a risk to assume!



Mechanical Engineer


Building owners rep.

Specification writer

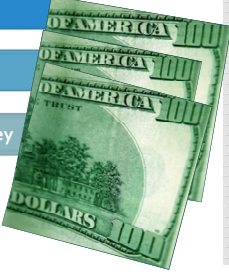
Data acquisition is the process of gathering all necessary information to create a complete proposal. This is usually equated with **being in the field or at the project's location**. The accuracy and integrity of the data accumulated is the beginning point of using the bid estimation system.


There are 2 types of data that we initially gather. The first is **mechanical system data** and the second is all other **project-related costs**. Blueprints are the best way to gather the mechanical system data but should not be completely relied upon.



What is the difference?

Components
↓
Tasks
↓
Both Words = Money






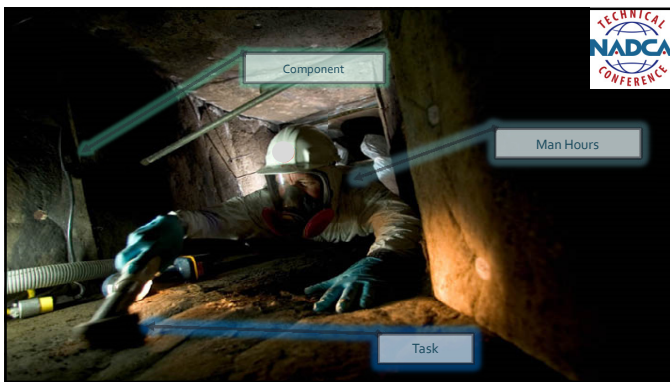
Definition of **Component** :

- **Component (HVAC System Component)** - A **Component**, or HVAC system component, is any individual item that's part of delivering air within an HVAC system.
 - Examples of **Components** are VAV Boxes, Lined Ducts, Metal Ducts and Air Handling Units.


Definition of *Task* from the Bid Estimator Manual:



- **Task** - A *Task* is a specific job or service that is performed to an HVAC system **Component**.
 - Examples of *Tasks* include cleaning a duct surface, reconditioning an AHU or applying a coating product to a fiberglass duct system. The specific *Task(s)* being performed on a HVAC system **Component**, regulate labor, materials and equipment required to complete the work on that **Component**.





Multiplying both Items Produces Man Hours



Component
x Task

= Man Hours

$$\begin{array}{r}
 6 \text{ VAV Boxes} \\
 \times 3 \text{ Man/Hrs} \\
 \hline
 = 18 \text{ Man/Hrs}
 \end{array}$$




Task Clean 16 Man Hours

Task Coat 2 Man Hours

Component
7.5 -10 Ton

Task Clean: Materials
Coil Cleaner 3 gallons
Rubber Gloves

Task Coat: Materials
Fungaloid Coating 17 sq. ft. per gallon
Tyvek Suits
Painters Hoods

Task Clean: Equipment
Negative Air Machine
Contact HEPA Vacuum

Task Coat: Equipment
Negative Air Machine
Paint Sprayer
Paint Mixing tools
Paint Strainer

Material Equipment Usage Selection Process



Hands On Doing Take Off's

Tools Needed

- ✓ Highlighters
- ✓ Scale Ruler
- ✓ Scale master








Scale Ruler





Blueprints and Plans for HVAC
Joseph Moravek, Frank Miller
BARNES & NOBLE
www.bn.com
• \$120 approximate price




The World's Finest Measuring Tools

The Plan Wheel XLU2 is the perfect tool for taking scaled measurements from blueprints, maps and plans. Just select the built-in scale factor to match the plan and roll the PlanWheel. The measurement is displayed instantly. Portable, uses two AAA batteries (included). Connects to your computer with optional Interface Kit.




Cost around: \$100



Factors Affecting Pricing


- Age of Ductwork
- Type of Materials Used for Fabrication
- Accuracy in Take Off
- Operating Overhead
- Production of Work Crews
- Type of Tools and Equipment in Use
- Material Costs - Material Percentage



Factors Affecting Pricing Criteria

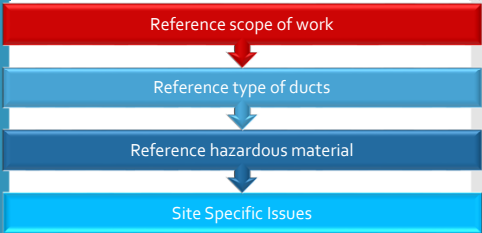

- Set-Up Time
- Contamination Level of the Duct System
- Accessibility of Items to be Serviced

Current Pricing Methods




- Price by Linear Footage
- Price by Man/Hour
- Price by Point
- Flat Rate Pricing
- Materials plus Mark-Up
- Materials with no Mark-Up
- Price by Building Square Footage

General Notes




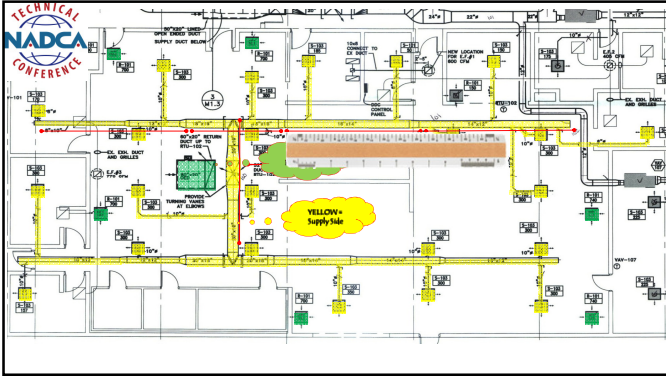
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graph TD; A[Reference scope of work] --> B[Reference type of ducts]; B --> C[Reference hazardous material]; C --> D[Site Specific Issues];
```

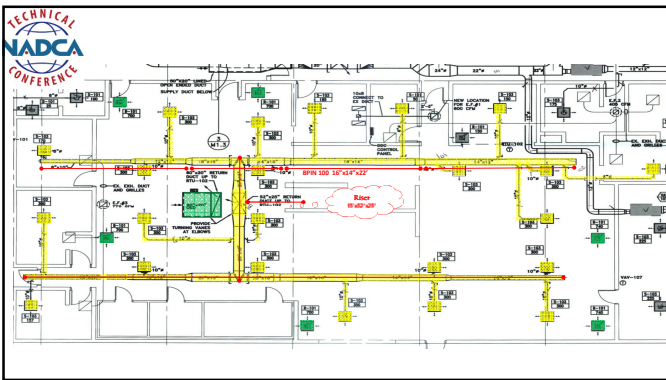
Doing Take-Off's on Mechanical Drawings



1. Review specifications to understand scope of project.
2. Confirm you have all mechanical pages.
3. Identify AHU's or other systems of concern
4. Review equipment schedules (if available).
5. Review notes on drawings.









Converting Duct Size to Sq..

Example: Duct is 16"x18"x 150'




What is the Square Footage?

16+16+18+18 divided by 2 x 150 = 850 Sq. Ft.



Estimating Materials



- Line item each material
- % of labor method



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Estimating Other Items


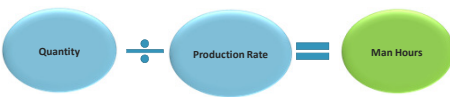

- Subcontractors
- Equipment rental
- Mobilization
- Demobilization
- Equipment maintenance
- Travel costs
- Project Management
- Others




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Estimating Labor

Converting take-off's to man hours




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Blueprint Reading & Estimating for Commercial Projects

Project Totals

- Labor
- Materials
- Total




Blueprint Reading & Estimating for Commercial Projects

Q&A

You have Questions

We have Answers



Blueprint Reading & Estimating for Commercial Projects

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