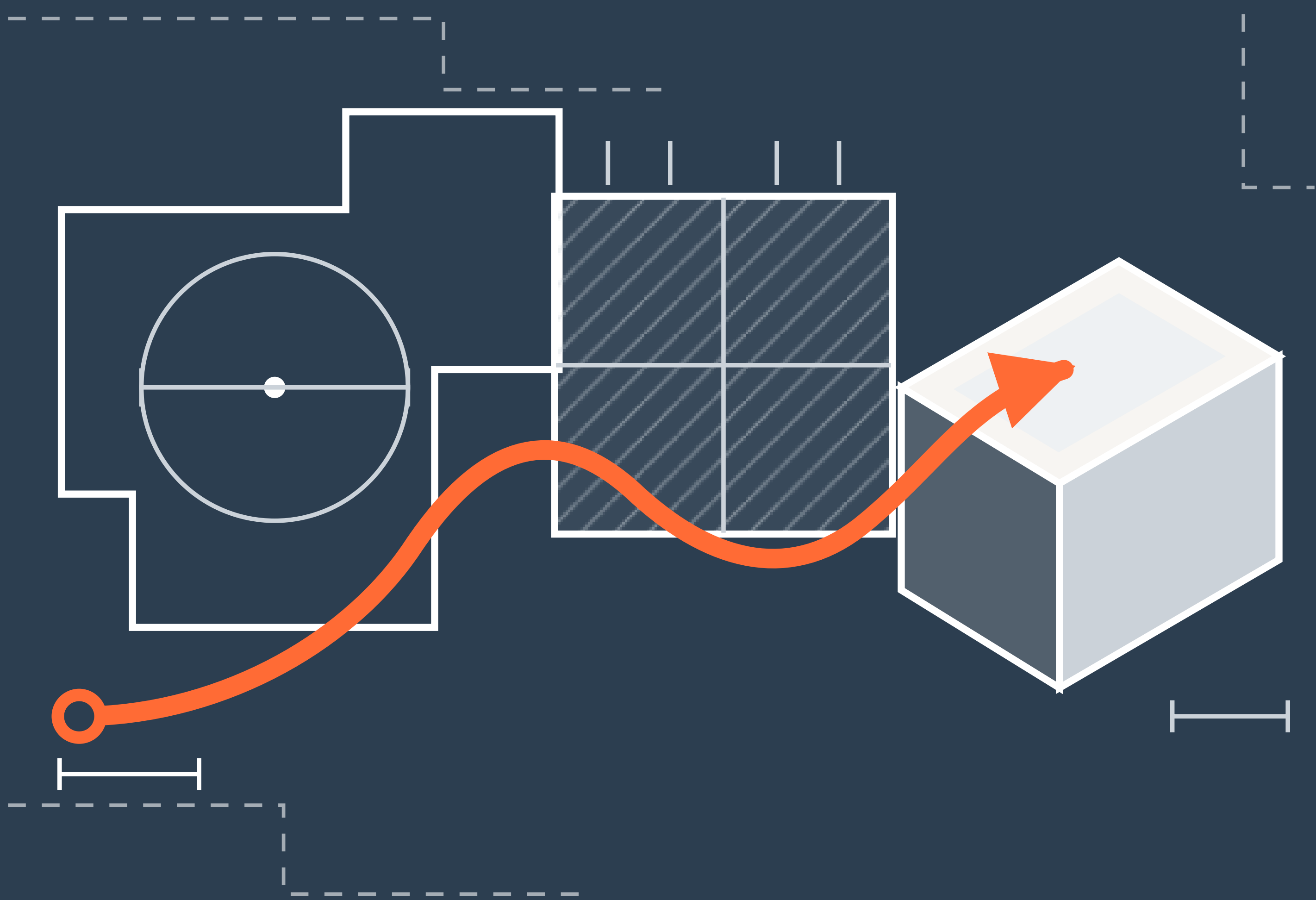
Concrete Project Planning & Estimating Guide

A Practical Guide to Concrete Quantity, Materials, Waste, Ready-Mix, Costs & Project Planning



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CONCRETECALCULATE FIELD GUIDE

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This guide is educational and informational. It explains general planning, measurement, quantity, and estimating methods; it is not a project design, engineering service, construction specification, safety plan, supplier quote, or guarantee of cost or performance.

Conditions differ from site to site. Codes, permits, inspections, project documents, structural details, soils, weather, materials, producer practices, product instructions, prices, taxes, fees, and labor conditions may also differ. Verify critical information with the authority having jurisdiction, project documents, concrete producer, product manufacturer, qualified contractor, or licensed design professional, as appropriate.

Concrete work can involve heavy loads, moving equipment, unstable forms or excavations, wet cement, respirable crystalline silica, electricity, and other hazards. Employers and workers remain responsible for applicable OSHA requirements, task-specific controls, training, and protective equipment. Homeowners and DIY readers should review the product label and safety data sheet, use the hazard-recognition baseline in Section 9.1, and not attempt work beyond their competence, equipment, or available help.

Calculations in this guide are planning examples. Recheck measurements and arithmetic, confirm order quantities and supplier terms, and obtain current local quotations before committing money or placing an order.

Contents

How to Use This Guide

Use the book in order for a first project. Chapters 1–3 establish the vocabulary, measurements, and volume math. Chapters 4–6 turn a geometric result into a practical quantity and fuller material plan. Chapters 7–8 build cost and contractor-pricing logic. Chapter 9 organizes the work before placement. Chapters 10–12 provide review tools you can reuse.

For an existing estimate, start with the chapter that matches the task, then follow any cross-references backward. A cost estimate is only as reliable as its scope and quantity takeoff; a quantity calculation is only as reliable as its measurements.

Three labels appear throughout the guide:

- **Net volume** is the theoretical volume of the measured geometry.
- **Practical order quantity** is the quantity selected after documented project variability and supplier ordering terms are considered.
- **Project control** means a decision that must come from current plans, specifications, the local authority, a producer, a manufacturer, site conditions, or qualified judgment—not from a generic book.

Quick Project Planning Roadmap

Stage	Main question	Record to keep
Define	What exactly is being built?	Written scope and project sections
Measure	What are the verified dimensions and units?	Field measurement sheet
Calculate	What is the net geometric volume?	Cubic feet and cubic yards
Adjust	What documented variability affects the order?	Practical quantity decision
Select supply	Ready-mix, bags, or a different project approach?	Supply plan and supplier/product confirmations
Take off materials	What else is needed besides concrete?	Material list with units and sources
Estimate	What direct and indirect costs apply?	Dated estimate with assumptions
Coordinate	Are access, labor, tools, weather, delivery, finishing, and curing planned?	Pre-pour plan
Review	What remains unverified?	Final hold-point checklist

The roadmap is a planning sequence, not an agency procedure. Federal estimating sources used in the research support general disciplines such as scope definition, quantity takeoff, assumptions, risk documentation, and review; they do not make federal or DoD procedures mandatory for private work.

Introduction — Plan First, Pour Once

Why concrete planning matters

Fresh concrete creates a short, demanding work window. Measurements, access, forms, tools, labor, material supply, finishing, and protection must come together at the site. A correction that is easy on paper may be difficult after a truck is scheduled or a batch is mixed.

Planning cannot guarantee a perfect project, but it can expose assumptions while there is still time to check them. The practical habit is simple: define the scope, measure it, calculate it, challenge the assumptions, price the complete work, and coordinate the pour before material arrives.

The cost of measurement and quantity mistakes

A dimension error travels through the estimate. If thickness is wrong, concrete volume is wrong. If volume is wrong, bag count or order quantity is wrong. Delivery, labor, schedule, and cost decisions may then be built on the same error.

The opposite problem is also real: a correct formula cannot repair an incorrect field measurement. Measure critical dimensions more than once, record units beside every value, and keep theoretical volume separate from any later allowance or rounding.

Why estimating involves more than concrete volume

Concrete may be the largest material line, but it is rarely the entire project. Depending on the job, costs may include base material, forms, reinforcement specified for the project, joint materials, curing materials, delivery, pumping or placement equipment, labor, mobilization, disposal, permits, and business overhead.

A useful estimate therefore answers two different questions:

1. **How much physical work and material are in the scope?**
2. **What will it cost this customer or business, at this place and time, to deliver that scope?**

The first is primarily a quantity problem. The second adds quotations, productivity, company cost structure, risk, and commercial decisions.

How this guide will take the reader from measurements to a project plan

This guide moves in the same direction as the work: measurements become net volume; net volume becomes a practical supply decision; the supply decision joins a material takeoff; the takeoff becomes a cost estimate; and the estimate is coordinated with access, people, equipment, weather, placement, finishing, and curing.

Keep unresolved items visible at every stage. “Verify locally” is not filler; it marks a real project decision that cannot safely be nationalized.

Selected sources: U.S. Department of Defense, *UFS 3-740-05, Construction Cost Estimating* (2026); U.S. Government Accountability Office, *Cost Estimating and Assessment Guide* (2020); NRMCA, *CIP 31—Ordering Ready Mixed Concrete* (2023) and *CIP 8—Discrepancies in Yield* (2016). Full citations and use limits appear in Back Matter C.

CHAPTER 01

Concrete Basics Every Project Planner Should Know

READER OUTCOME

Understand the concrete terminology and basic material concepts needed for project planning.

1.1 What Concrete Is Made From

Concrete is a composite material made by combining cementitious material, water, fine aggregate, coarse aggregate, and—when selected for the mixture—chemical admixtures or supplementary cementitious materials. Cement and water form the binding paste. The aggregates occupy much of the mixture's volume and provide a stable granular framework.

These ingredients are not a field recipe to improvise. Their proportions and properties affect fresh behavior, strength development, durability, finishability, and compatibility with the project. For ready-mix work, the producer and project specification control the supplied mixture. For bagged material, the specific manufacturer's instructions control preparation and use.

PLANNING NOTE

Planning note: Quantity calculations determine how much volume must be filled. They do not design the concrete mixture.

1.2 Cement vs. Concrete

Cement is an ingredient. Concrete is the finished composite made with cementitious binder, water, and aggregate. Using the words interchangeably can cause confusion when ordering, estimating, or discussing a product.

A bag labeled **concrete mix** normally contains dry cementitious material and aggregate intended to be combined with water according to the product instructions. A bag of cement alone is not the same product and does not produce concrete by itself.

1.3 Aggregates and Water

Fine aggregate generally refers to smaller particles; coarse aggregate refers to larger particles. Their grading, moisture, cleanliness, shape, and compatibility affect the mixture. Those decisions belong to the producer, product manufacturer, or project specification.

Water makes mixing and cement hydration possible, but water is not a harmless way to make concrete easier to move. Uncontrolled water changes can alter the mixture's behavior and performance. Do not add water based on appearance alone. Follow the bag label or coordinate any ready-mix adjustment with the producer and the person responsible for the project requirements.

1.4 Chemical and Mineral Admixtures

Chemical admixtures are ingredients added in controlled quantities to modify fresh or hardened behavior. Depending on the product and mixture, they may influence water demand, setting behavior, air content, workability, or other properties.

Supplementary cementitious materials, or **SCMs**, are cementitious or pozzolanic materials used as part of the binder system. Common categories include fly ash, slag cement, natural pozzolans, and newer materials covered by evolving standards. Their availability and effects depend on the source material, mixture, exposure, project requirements, and producer practice.

Portland-limestone cement, commonly identified as **Type IL** in the U.S. ASTM C595 context, is a blended hydraulic cement. Its presence does not give a planner permission to assume a particular strength, finishing response, curing need, or substitution rule. Confirm the actual mixture and project requirements with the producer or specification.

1.5 Water-Cement Ratio

The water-cement ratio expresses water mass relative to cement mass. Where other cementitious materials are included, project documents and technical sources may instead refer to a water-cementitious-material ratio.

The relationship matters because water and binder proportions influence the pore structure and performance of hardened concrete. But "less water is always better" is not a useful field rule. The mixture still has to be produced, placed, consolidated, finished, and cured as intended. The correct ratio and allowable field adjustments are mixture- and project-specific.

For planning purposes, do not change a supplied mixture casually to solve an access, crew, or placement problem. Address those constraints before ordering.

1.6 Concrete Strength Basics

Concrete strength is commonly discussed in pounds per square inch, or **psi**, and compressive strength is a common project property. The specified value, test age, sampling/testing method, acceptance criteria, and responsible parties come from project documents and applicable current standards—not from a generic project guide.

Strength develops over time and depends on the mixture, production, placement, consolidation, temperature, moisture management, testing, and other conditions. A higher advertised psi does not automatically make a product appropriate for every job, and a volume calculator cannot select structural strength.

1.7 Workability Basics

Workability describes how fresh concrete can be mixed, handled, placed, consolidated, and finished for the intended work. It is not the same as “wetness,” and it should not be adjusted by indiscriminate water addition.

Access, placement distance, reinforcement congestion, shape, weather, crew capacity, equipment, finish, and mixture characteristics all affect what is workable. Discuss placement needs when ordering ready-mix. For bagged products, follow the selected product’s mixing and water instructions.

1.8 Durability Basics

Durability is the ability to resist the service conditions the concrete will face. Exposure to moisture, freezing and thawing, deicing chemicals, sulfates, abrasion, or other conditions may affect material and detailing choices.

Those choices are not universal across the United States. Climate, drainage, intended use, project type, local requirements, and exposure all matter. The planner’s job is to identify the exposure questions and make sure the project documents, producer, manufacturer, or qualified professional answers them.

1.9 Ready-Mix Concrete

Ready-mix concrete is produced for delivery to the project. It can reduce on-site batching labor and support larger or more continuous placements, but it adds coordination requirements: order information, access, truck or placing-equipment position, delivery sequence, unloading plan, crew readiness, and supplier terms.

Truck capacity, legal payload, minimum charges, short-load thresholds, included unloading time, standby, delivery zones, and add-on charges vary. Confirm every one that matters with the actual producer. Do not use a generic truck or fee assumption as a supplier promise.

1.10 Bagged Concrete

Bagged concrete mix is a packaged dry product. The planner calculates the required project volume and divides it by the approximate yield stated for the exact product and bag size, then rounds up to whole bags. Bag sizes and yields are product- and market-specific.

For example, the October 2022 data sheet for QUIKRETE Concrete Mix 1101 lists approximate yields for several bag sizes, and Sakrete publishes product-specific sizes and yields for its High-Strength Concrete Mix. These are named product examples, not universal values for every bag on a store shelf. Always check the current package or manufacturer data sheet.

1.11 Ready-Mix vs. Bagged Concrete: Basic Comparison

Planning factor	Ready-mix	Bagged concrete
Quantity	Often practical when a producer delivery fits the placement	Often practical for smaller or staged quantities, subject to labor and mixing capacity
Labor	Reduces on-site batching but still requires placement/finishing crew	Adds handling, mixing, and batch-to-batch work
Timing	Requires delivery coordination and a ready site	Can offer more control over when individual batches are mixed
Access	Requires a safe delivery/placement plan	Requires storage, lifting, water, mixer or mixing method, and movement to the placement
Consistency	Producer controls the ordered mixture, subject to project/order requirements	Depends on using the same product and following instructions consistently
Cost	Includes local material, delivery, small-load, and other supplier terms	Includes product price, whole-bag rounding, transport, labor, mixing equipment, and waste
Best decision basis	Complete project logistics and quote	Complete project logistics and product-specific yield—not bag price alone

No national break-even volume decides the choice for every project. Compare the complete plan.

Selected sources: ACI, *Concrete Terminology* (2025); American Cement Association cement, concrete, and blended-cement resources; official ASTM catalog records for the named cement, admixture, SCM, packaged-concrete, and ready-mix standards; NRMCA CIPs 30, 31, and 45; and the named QUIKRETE and Sakrete product information. The 2011 textbook and ACI 318-11 were not used as evidence. Full citations appear in Back Matter C.

CHAPTER 02

Measure Your Concrete Project Correctly

READER OUTCOME

Collect reliable dimensions before performing quantity or cost calculations.

2.1 Start With the Project Shape

Draw the project before measuring it. The sketch can be rough, but it should show every section that will receive concrete. Label rectangles, circles, walls, continuous runs, isolated pads, steps, thickened areas, openings, and changes in thickness separately.

Use simple shapes whenever possible. An L-shaped slab can become two rectangles. A pad with a round pier can become a rectangle plus a cylinder. Separate calculations are easier to check than one complicated average.

2.2 Length, Width, Thickness, and Depth

For horizontal rectangular work:

- **Length** and **width** describe the plan dimensions.
- **Thickness** describes the vertical concrete dimension.

For footings and trenches, the same vertical dimension may be called **depth**. For walls, measure length, height, and thickness. For circular elements, record diameter or radius and the vertical dimension.

Write units beside every number. Anyone reviewing the sheet should know whether “6” means inches, feet, or six identical items. Thickness or depth must come from project documents or qualified decisions; this guide does not select it.

2.3 Measuring Rectangular Slabs

Measure the actual form or excavation, not just the nominal finished dimensions. Check length and width along more than one line when the edges may not be parallel. Check diagonals if squareness matters to the project. Record thickness at multiple locations when the subgrade varies.

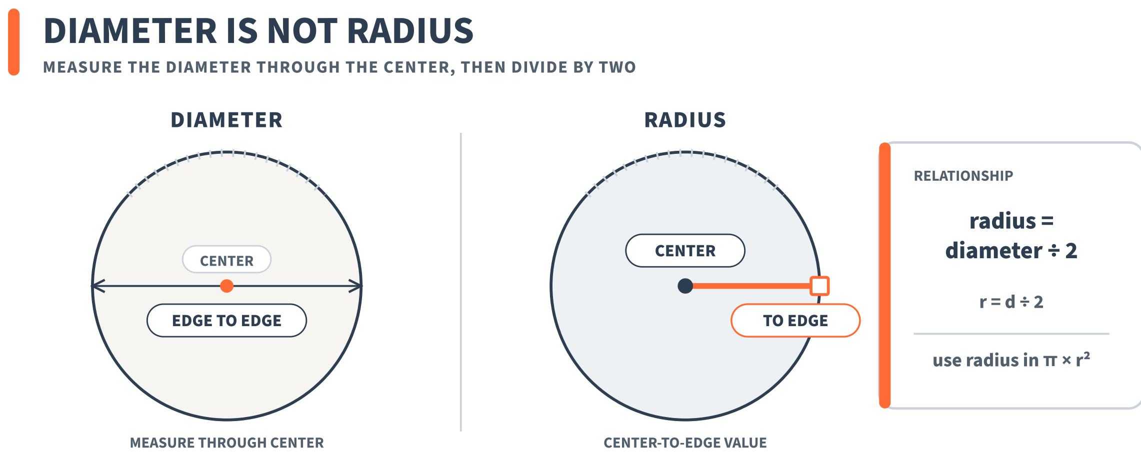
For a clean rectangle, the field sheet should contain:

Section	Length (ft)	Width (ft)	Thickness (in)	Notes
Main slab				Forms checked; thickness source identified

2.4 Measuring Circular Projects

Measure the diameter through the center. If the form is not truly round, record several diameters and decide—with appropriate project judgment—whether the shape should be divided, approximated, or corrected before calculation.

The radius used in the circular formula is half the diameter. Label the field measurement clearly so diameter is not accidentally entered as radius.



For circular quantity calculations, measure the diameter through the center, then divide by two to obtain the radius used in the area formula.

2.5 Measuring Footings

For quantity only, a continuous rectangular footing uses total length, width, and depth. Count separate footings and record each size group. If dimensions change, split the work into separate sections.

Footing size, depth, reinforcement, bearing, frost considerations, and other structural or code decisions are outside the quantity calculation. Use the project drawings, current local requirements, and a qualified professional where needed.

2.6 Measuring Concrete Walls

Record wall length, height, and thickness. List openings, pilasters, returns, changes in thickness, and intersecting walls separately. Do not subtract an opening automatically: confirm how the forms and pour are actually configured and whether another component replaces some or all of that volume.

Wall stability, form pressure, reinforcement, bracing, placement sequence, and structural design require project-specific planning beyond a geometric volume calculation.

2.7 Measuring Multiple Sections

Give each section a unique name. Calculate it separately later, then add the results only after every section is expressed in the same unit.

A useful field naming system might be **A—main slab**, **B—landing**, **C—round pad**, and **D—thickened area**. That simple discipline makes it possible to trace a number in the estimate back to the site.

2.8 Handling Irregular Areas

Break an irregular footprint into simple shapes that approximate the actual work. Mark overlaps so they are not counted twice and gaps so they are not missed. Curves may require field measurements, offsets, or a more detailed layout or survey than a rough sketch can provide.

An approximation should be labeled as an approximation. If the difference could materially affect cost, supply, or structural work, improve the measurement rather than hiding uncertainty inside a waste percentage.

2.9 Recording Field Measurements

Use one measurement sheet for the project. Include:

- project name, location, date, and person measuring;
- sketch revision and source of required thickness/depth;
- each section name and shape;
- raw dimensions with units;
- openings, slopes, thickened areas, or irregular conditions;
- repeated-item count;
- measurement method and access limitations; and
- a second-check column with initials/date.

Keep raw measurements. Do not overwrite them with rounded calculation inputs.

2.10 Measurement Checklist

- [ ] Define the scope and finished boundaries.
- [ ] Show every pour section on the sketch.
- [ ] Identify the project source for required thickness or depth.
- [ ] Record units for all lengths, widths, heights, diameters, and counts.
- [ ] Distinguish diameter from radius.
- [ ] Address openings, steps, edges, returns, and thickened areas.
- [ ] Divide irregular areas into traceable shapes.
- [ ] Check forms and excavation against intended dimensions.
- [ ] Record variable subgrade or excavation depth.
- [ ] Independently check critical measurements in the field.

2.11 Common Measurement Mistakes

Common failures include measuring a drawing but not the built forms, recording thickness without units, using diameter as radius, averaging an irregular area without documenting the approximation, overlooking a landing or thickened edge, subtracting openings incorrectly, and rounding raw dimensions too early.

The correction is procedural: sketch, label, measure, record units, divide complex work into sections, and have another person check the critical dimensions.

Selected sources: *UFS 3-740-05* (2026) and GAO-20-195G support measurement, takeoff, documentation, and review disciplines. ACI CODE-318-25 and the public ACI 302.1R-15 Chapter 5 excerpt are cited only for scope awareness; project documents and qualified design control structural dimensions. Full citations appear in Back Matter C.

CHAPTER 03

Calculate How Much Concrete You Need

READER OUTCOME

Calculate theoretical concrete volume correctly and understand the units used when ordering concrete.

3.1 Understanding Concrete Volume

Concrete fills three-dimensional space. Area alone is not enough; thickness or depth must be included.

For a rectangular element:

FORMULA

Volume = length × width × thickness

All three dimensions must use compatible units before multiplication. When length and width are in feet and thickness is in inches, convert thickness to feet first or use the verified shortcut in Section 3.6.

3.2 Cubic Feet

A cubic foot is the volume of a cube one foot long, one foot wide, and one foot high. When project dimensions are entered in feet, the multiplication result is cubic feet.

Keep the unit exponent visible: square feet (ft^2) describe area; cubic feet (ft^3) describe volume.

3.3 Cubic Yards

Ready-mix quantities in the United States are commonly discussed in cubic yards. Convert cubic feet to cubic yards by dividing by 27:

FORMULA

Cubic yards = cubic feet ÷ 27

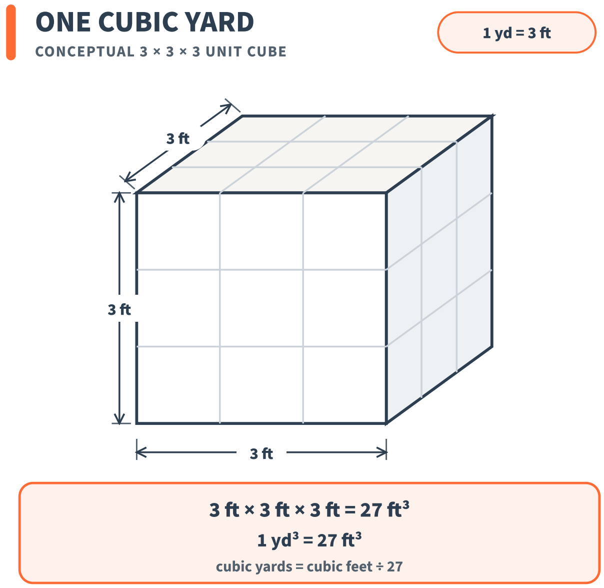
The result is theoretical volume, not automatically the quantity to order.

3.4 Why 27 Cubic Feet Equals 1 Cubic Yard

One yard is three feet. A cube one yard on every side is therefore:

FORMULA

$3\text{ ft} \times 3\text{ ft} \times 3\text{ ft} = 27\text{ ft}^3$



A cubic yard contains 27 cubic feet because each of its three dimensions equals three feet.

That is why the conversion divides cubic feet by 27.

3.5 Converting Inches of Thickness to Feet

FORMULA

Thickness in feet = thickness in inches ÷ 12

Thickness	Feet, exact or rounded for display
2 in	0.1667 ft
3 in	0.2500 ft
4 in	0.3333 ft
5 in	0.4167 ft
6 in	0.5000 ft
8 in	0.6667 ft
10 in	0.8333 ft
12 in	1.0000 ft

Keep full precision in the calculation and round only the displayed result.

3.6 Rectangle/Slab Volume Formula

When all dimensions are in feet:

> FORMULA
>
> **Cubic feet = length (ft) × width (ft) × thickness (ft)**

> FORMULA
>
> **Cubic yards = cubic feet ÷ 27**

When length and width are in feet and thickness is in inches, the two conversions can be combined:

> FORMULA
>
> **Cubic yards = length (ft) × width (ft) × thickness (in) ÷ 324**

The denominator is 12×27: 12 converts inches to feet, and 27 converts cubic feet to cubic yards.

3.7 Circular Volume Formula

A circular slab or cylindrical element uses:

> FORMULA
>
> **Volume = $\pi \times \text{radius}^2 \times$ thickness**

Radius is half the diameter. For a 10-foot-diameter circular pad with a hypothetical 4-inch thickness supplied by the project:

1. Radius: $10 \div 2 = 5$ ft
2. Thickness: $4 \div 12 = 0.3333$ ft
3. Cubic feet: $\pi \times 5^2 \times (4 \div 12) = 26.18\ \text{ft}^3$
4. Cubic yards: $26.18 \div 27 = 0.97\ \text{yd}^3$

The $0.97\ \text{yd}^3$ is net geometry only.

3.8 Footing and Wall Calculations

For a rectangular continuous footing:

> FORMULA
>
> **Volume = total length × width × depth**

For a wall:

FORMULA

Volume = length × height × thickness

For repeated isolated elements, calculate one element and multiply by the count. These formulas calculate quantities from supplied dimensions; they do not determine safe or code-compliant dimensions.

3.9 Multiple-Section Calculations

Calculate each section in cubic feet, then add the sections and convert the total to cubic yards. This avoids rounding each small section too early.

FORMULA

Total cubic feet = Section A + Section B + Section C + …

FORMULA

Total cubic yards = total cubic feet ÷ 27

3.10 Worked Example — Concrete Slab

Given: A rectangular slab is 12 ft long and 10 ft wide. The project documents specify a 4 in thickness for this example.

1. Convert thickness: $4 \div 12 = 0.333333\ldots$ ft
2. Volume: $12 \times 10 \times (4 \div 12) = 40.00$ ft^3
3. Convert: $40 \div 27 = 1.48148\ldots$ yd^3
4. Report net volume: **1.48 yd^3**

Shortcut check: $12 \times 10 \times 4 \div 324 = 1.48148\ldots$ yd^3.

3.11 Worked Example — Driveway

Given: A driveway section is 24 ft long and 12 ft wide. A hypothetical project specification supplies a 5 in thickness; the example does not recommend that thickness.

1. Cubic feet: $24 \times 12 \times (5 \div 12) = 120.00$ ft^3
2. Cubic yards: $120 \div 27 = 4.44444\ldots$ yd^3
3. Report net volume: **4.44 yd^3**

The base, reinforcement, drainage, strength, and thickness must come from the actual project.

3.12 Worked Example — Footing

Quantity example only—not footing design.

Given: Project drawings show two continuous runs totaling 48 ft, each 16 in wide and 8 in deep.

1. Width: $16 \div 12 = 1.333333\ldots$ ft
2. Depth: $8 \div 12 = 0.666666\ldots$ ft
3. Cubic feet: $48 \times (16 \div 12) \times (8 \div 12) = 42.66667$ ft^3
4. Cubic yards: $42.66667 \div 27 = 1.58025$ yd^3
5. Report net volume: **1.58 yd^3**

The example assumes the dimensions were designed and approved elsewhere.

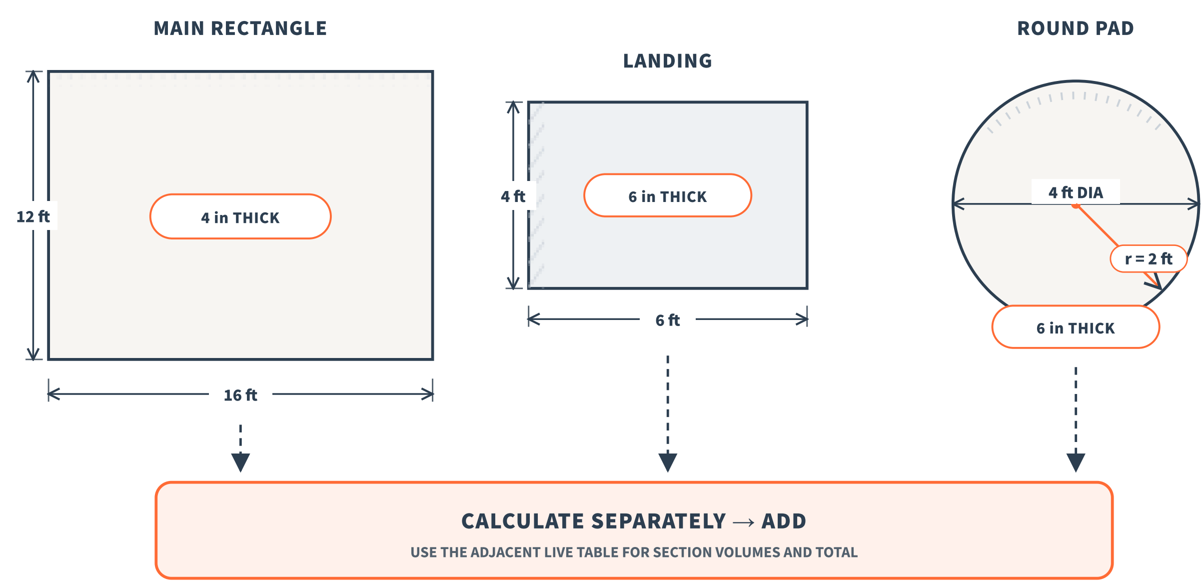
3.13 Worked Example — Multiple Sections

Given: One placement contains:

- Main rectangle: 16 ft × 12 ft × 4 in
- Landing: 6 ft × 4 ft × 6 in
- Round pad: 4 ft diameter × 6 in

CALCULATE EACH SECTION, THEN ADD ONCE

HYPOTHETICAL QUANTITY GEOMETRY — NOT A DESIGN; SCHEMATIC — NOT TO SCALE



Divide a multi-section placement into simple shapes, calculate each volume without early rounding, and add the section volumes once.

Calculate without early rounding:

Section	Calculation	Volume
Main rectangle	$16 \times 12 \times (4 \div 12)$	64.00 ft^3
Landing	$6 \times 4 \times (6 \div 12)$	12.00 ft^3
Round pad	$\pi \times 2^2 \times (6 \div 12)$	6.28319 ft^3
Total	$64 + 12 + 6.28319$	**82.28319 ft^3**

FORMULA

$$82.28319 \div 27 = 3.04753 \text{ yd}^3$$

Report net volume: **3.05 yd^3**. Section dimensions are hypothetical, not design guidance.

3.14 Checking Your Calculation

Use a deliberate second pass:

1. Compare the calculation sheet with the latest field sketch.
2. Check that every section appears once—no omissions or overlap.
3. Confirm each dimension and unit.
4. Recalculate using a second method where possible, such as the 324 shortcut.
5. Compare the answer with a rough magnitude check.
6. Keep net volume separate from allowance and supplier rounding.
7. Have another person review critical inputs before ordering.

Too many decimal places can hide weak inputs. Carry precision during arithmetic, then report a sensible planning result.

3.15 Using ConcreteCalculate Quantity Calculators

No ConcreteCalculate calculator is endorsed in this edition. The only approved ConcreteCalculate destination under this locked section heading is How to Calculate Concrete, an informational walkthrough rather than an interactive calculator. Use it to review the measurement-to-volume process, not as evidence for project design, code compliance, supplier policy, or current pricing.

Use the resource in a controlled way:

1. Record the project shape, dimensions, and units on your own field sheet first.
2. Work the applicable formula in this chapter and retain the unrounded result.
3. Compare the guide's method with your calculation; investigate any difference instead of choosing the preferred answer.
4. Keep the net result separate from project-specific additions and supplier rounding.
5. Have another person check critical measurements and arithmetic before ordering.

The guide page contains outbound links to other site tools. Those outbound calculators were outside this ebook's approval and should not be treated as endorsed merely because they appear on the approved guide page.

Selected sources: Stable geometry and U.S. unit relationships; *UFS 3-740-05* and GAO-20-195G for quantity review; NRMCA *CIP 8—Discrepancies in Yield* for quantity/yield context; and the audited ConcreteCalculate informational guide above. Full citations appear in Back Matter C. Every worked calculation was independently verified.

CHAPTER 04

Waste, Shortfalls & How Much Concrete to Order

READER OUTCOME

Convert theoretical volume into a practical order quantity without treating one waste percentage as universal.

4.1 Calculated Volume vs. Actual Order Quantity

The calculation in Chapter 3 describes perfect geometry from recorded dimensions. A practical order decision may differ because the built space, placement, and supplier terms are not perfect geometry.

Keep the two values separate:

FORMULA

Net volume = measured geometric volume

FORMULA

Pre-round order basis = net volume + documented project-specific additions

FORMULA

Practical order quantity = quantity confirmed after supplier increments, minimums, and project review

Do not quietly bury the difference inside the original dimensions.

4.2 Why Real Projects Use More Than Perfect Geometry Predicts

Possible causes include variable excavation, uneven subgrade, forms that are not exactly on line, dimensional tolerances, overexcavation, irregular edges, material left in equipment or access paths, and small placement losses. Not every cause applies to every project, and some can be measured or corrected before ordering.

4.3 Uneven Excavation and Subgrade

A low area beneath a slab increases volume. Measure meaningful variation rather than assuming the entire project has the same extra depth. If the subgrade is not ready, correcting it may be better than buying concrete to fill an unintended depression.

Base type, thickness, grading, and compaction are project decisions. This book does not provide a universal residential base specification.

4.4 Form and Dimensional Variations

Forms can bow, shift, flare, or be set beyond the intended line. Trenches may widen in loose soil. Walls and edges may include returns or thickened areas that were missed on the first sketch.

Recheck the actual forms and excavation. A measured variation belongs in the quantity takeoff; it should not be treated as mysterious waste.

4.5 Placement Losses

Some concrete may remain in handling equipment or be lost during movement and cleanup. The extent depends on the placement method, access, crew, equipment, and site. No responsible national percentage fits every project.

Reduce avoidable loss by planning the route, equipment, crew positions, and cleanup location before material arrives.

4.6 Understanding Concrete Yield

Yield is the volume of fresh concrete produced or delivered from a known batch quantity. A difference between ordered quantity, calculated form volume, and observed fill can have more than one cause: field dimensions, air content, batch/yield variation, spillage, form movement, or calculation error.

Do not diagnose a shortage from appearance alone. Preserve order records and measurements and involve the producer when a delivered-yield question arises. Formal testing and acceptance procedures belong to applicable current standards and project requirements.

4.7 Waste Allowance

An allowance is an estimating decision used to address identified uncertainty. It is not a substitute for measurement, base preparation, or form correction. One percentage should not be copied from project to project without explanation.

Record the allowance separately so reviewers can see:

- what uncertainty it addresses;
- why it remains after reasonable measurement/correction;
- whether it is expressed as measured volume, a project-selected factor, or a fixed quantity; and
- who approved the decision.

4.8 Choosing a Reasonable Project-Specific Allowance

Ask:

1. How reliable are the measurements?

2. Is the excavation or subgrade uniform?
3. Are forms complete and stable?
4. Are there irregular edges, slopes, or hidden sections?
5. What is the placement route and loss exposure?
6. How difficult would a shortage be to recover from?
7. What can still be measured or corrected before ordering?
8. What ordering increments and minimum charges does the actual supplier use?

The answer may be a measured addition, a documented management allowance, or no separate allowance after corrections. The point is the reasoning, not a favorite percentage.

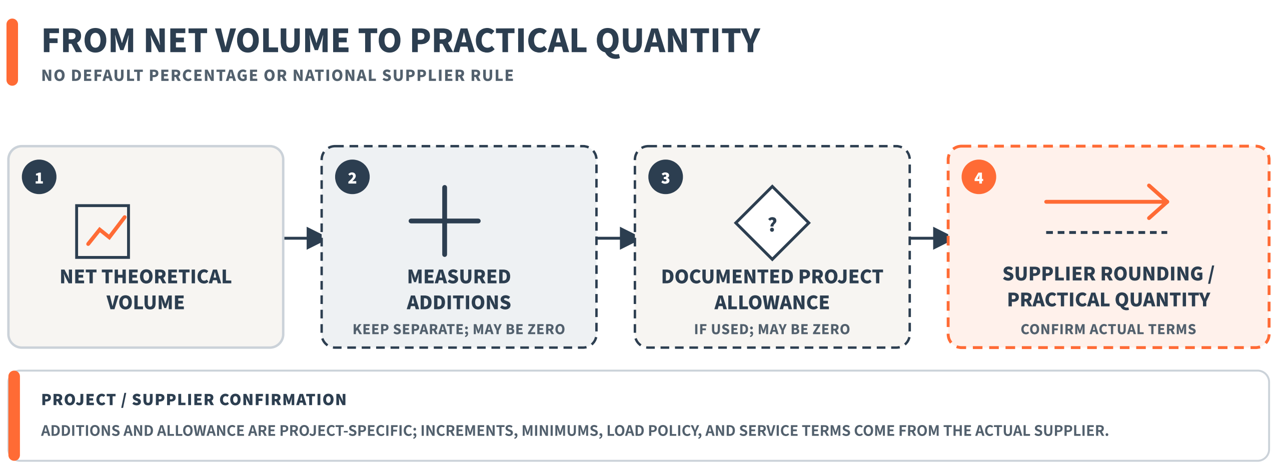
4.9 Rounding the Order Quantity

Rounding is supplier-specific. Confirm the producer's order increments, minimum quantity or minimum charge, load policy, and whether the quoted service is conventional ready-mix or another delivery model.

Illustrative decision—not a recommended allowance or supplier policy:

- Verified net volume from Chapter 3: 4.44444… yd^3 (displayed there as 4.44 yd^3)
- Planner's documented project-specific addition: 0.35 yd^3
- Pre-round basis: 4.44444… + 0.35 = 4.79444… yd^3
- Hypothetical supplier increment: 0.25 yd^3
- Round upward to the next accepted increment: **5.00 yd^3**

The 0.35 yd^3 and quarter-yard increment are scenario inputs, not national rules. Obtain the actual producer's confirmation.



A practical order quantity begins with verified geometry, keeps measured additions and any project allowance separate, and applies only the actual supplier's confirmed rounding and order rules.

4.10 Risks of Ordering Too Little

A shortage can interrupt placement, create an unplanned construction joint, leave labor and equipment waiting, trigger another delivery or small-load charge, or compromise the intended sequence. The actual consequence depends on the project and supplier.

Plan the response before ordering: identify who can stop or redirect work, whether another load is possible, and which project/design decisions require qualified approval.

4.11 Risks of Ordering Too Much

Excess concrete creates its own problems: added cost, site handling, disposal, environmental controls, and temptation to place it somewhere unplanned. Never assume a producer will accept unused material back without consequence. Ask about the supplier's policy and plan a lawful, safe response for excess material.

4.12 Final Quantity Review Before Ordering

- [ ] Match the latest field dimensions to the calculation sheet.
- [ ] Count every project section and repeated item once.
- [ ] Identify the source of each thickness or depth.
- [ ] Independently recalculate net cubic feet and cubic yards.
- [ ] Add measured variations as measured quantities.
- [ ] Document and approve any remaining allowance separately.
- [ ] Confirm producer increments, minimums, load limits, delivery, standby, and excess-material policies.
- [ ] Record practical order quantity separately from net volume.
- [ ] Review access, placement rate, crew, equipment, weather, and schedule.
- [ ] Communicate the final quantity with units and project or mixture information.

Selected sources: NRMCA *CIP 8—Discrepancies in Yield* and *CIP 31—Ordering Ready Mixed Concrete*; *UFS 3-740-05* and GAO-20-195G for assumption and risk documentation; FHWA-HIF-16-005 and the public ACI 302.1R-15 Chapter 5 excerpt for bounded pavement/site context. Full citations appear in Back Matter C. No universal waste percentage or supplier rounding rule is asserted.

CHAPTER 05

Ready-Mix or Concrete Bags?

READER OUTCOME

Choose a concrete supply method based on quantity, labor, logistics, equipment, and project conditions rather than price alone.

5.1 Understanding the Two Supply Methods

Ready-mix and bagged concrete can fill the same geometric need, but they create different project systems.

With ready-mix, the concrete is produced for delivery. Planning centers on order information, supplier terms, truck or pump access, unloading, placement rate, crew readiness, and schedule.

With bags, dry product is transported, stored, opened, measured with water, mixed, and moved to the placement in repeated batches. Planning centers on exact product yield, whole-bag quantity, lifting and handling, water, mixing capacity, consistency between batches, and labor.

Neither method is automatically cheaper or easier. The correct comparison includes the complete work.

5.2 How Bagged Concrete Quantities Are Calculated

Use the net project volume in cubic feet and the approximate yield for the exact product and bag size:

FORMULA

Bags required before whole-bag rounding = project volume (ft^3) ÷ yield per bag (ft^3)

Then round upward to a whole bag. If a project-specific allowance is needed, document whether it is applied to project volume before division or handled as additional whole bags. Do not apply it invisibly twice.

The manufacturer's current package or data sheet controls the yield input. Weight alone is not a yield calculation.

5.3 Common Bag Sizes

Bag sizes vary by product and market. The following are named examples, not a universal U.S. table.

QUIKRETE Concrete Mix 1101 — official data sheet revised October 2022

Bag size	Approximate yield
40 lb	0.30 ft^3
50 lb	0.375 ft^3

TABLE CONTINUED

Bag size	Approximate yield
60 lb	0.45 ft^3
80 lb	0.60 ft^3
90 lb	0.675 ft^3; listed as regional

The Sakrete High-Strength Concrete Mix page checked on 2026-08-29 displayed U.S. 40, 60, 80, and 90 lb sizes and public yields of 0.30, 0.45, and 0.60 ft^3 for the 40, 60, and 80 lb sizes. No public 90 lb yield was shown in the reviewed page, so this guide does not infer one.

Check current availability and instructions where the product will be purchased.

5.4 Estimating the Number of Bags

> **Worked example:** A small rectangular placement is 4 ft long, 2.5 ft wide, and has a project-supplied thickness of 4 in. The selected product is the named 80 lb QUIKRETE mix above with an approximate yield of 0.60 ft^3 per bag.

1. Project volume: $4 \times 2.5 \times (4 \div 12) = 3.33333$ ft^3
2. Raw bag count: $3.33333 \div 0.60 = 5.55556$ bags
3. Whole-bag quantity: **6 bags**

This is a yield example, not a recommendation of product, bag weight, or thickness. Confirm the current label and plan any project-specific extra quantity separately.

5.5 Ordering Ready-Mix Concrete

Prepare the order as a controlled information handoff. The producer may need, as applicable:

- project name, address, contact, and delivery point;
- requested date and sequence;
- quantity and units;
- project-specified mixture or performance information;
- placement method and expected unloading conditions;
- truck access, road/driveway limitations, staging, washout, and site contact;
- requested add-ons that are permitted by the project; and
- billing/customer information.

Ask the producer to repeat the critical order details. Keep the written quote and order confirmation. Do not substitute a generic internet mixture, strength, slump, or timing value for project requirements.

5.6 Ready-Mix Truck and Delivery Considerations

NRMCA's general "About Concrete" page describes typical truck mixers as carrying about 9–11 yd^3 because weight laws affect payload. Treat that only as orientation. Actual capacity depends on the truck, mixture, legal payload, roads, route, and producer.

Before ordering, confirm:

- maximum and practical load for the specific delivery;
- whether the truck can reach the planned position safely;
- overhead, width, height, turning, grade, surface, and underground-service constraints;
- whether a pump, conveyor, buggy, wheelbarrow, or other method is needed;
- delivery-zone, mileage, standby, unloading, environmental, seasonal, and cancellation terms; and
- how separate loads will be sequenced.

Do not direct a heavy truck onto a driveway, slab, shoulder, yard, or buried service without appropriate confirmation.

5.7 Short-Load Considerations

"Short load" is not one national quantity or fee. Verified 2026 examples differ:

- Gehring Ready-Mix in Nebraska lists a per-load charge for loads under 4 yd^3.
- A West Michigan supplier sheet lists a 2 yd^3 minimum and different haul charges for quantity bands.
- Townsend Concrete publishes zone-specific minimum and short-load terms for its mobile volumetric service, which is not the same service model as every conventional ready-mix producer.

Use these examples to understand the question, not to predict a local bill.

Dated local illustration: Gehring's published schedule effective 2026-01-01 listed its "SG3500" mix label at \$152/yd^3 and a \$50/load charge under 4 yd^3. At those published terms, a 3.5 yd^3 load would calculate as:

FORMULA

$$3.5 \times \$152 + \$50 = \$582$$

That excludes sales tax and any other applicable terms and is not a Nebraska-wide or national price.

5.8 Labor Requirements

Bagged concrete adds repeated handling and mixing. Ready-mix reduces that work but can demand a larger coordinated placement and finishing effort. Labor depends on access, distance, shape, equipment, mixture, weather, finish, crew skill, and sequence.

Do not select a crew from a generic production rate. Break the work into tasks—setup, mixing or unloading, moving, placing, consolidating where required, screeding, finishing, curing setup, cleanup, and documentation—and estimate labor-hours from company history or a clearly labeled project scenario.

For both safety planning and estimating, **labor-hours** count every person's time. Three people working six hours represent 18 labor-hours, not six. Chapter 8 shows the arithmetic.

5.9 Equipment and Placement Considerations

The supply method may change the required equipment:

Need	Ready-mix questions	Bagged-concrete questions
Move material	Can the truck discharge near the placement? Is pumping or another method required?	Where will bags be stored and mixed? How will repeated batches reach the forms?
Mix	What mixture and delivery sequence does the producer confirm?	What mixer/method, water control, power, and batch sequence do product instructions require?
Place/finish	Can the crew keep up with the planned delivery and geometry?	Can the crew maintain continuity and consistency across batches?
Cleanup	Where are lawful washout and cleanup areas?	Where will bags, dry-product dust controls, mixer cleanup, and leftover material be managed?

Equipment prices are intentionally omitted. Obtain a current local quote for the exact item, rental period, store, availability, delivery, fees, damage terms, and tax.

Before using either supply method, review the producer or product instructions and the safety data sheet. Plan skin and eye protection for contact with wet concrete, a task-specific dust-control method for opening and mixing bags, safe lifting or mechanical assistance, guarded equipment, and electrical controls suitable for wet work. Cutting, grinding, drilling, or chipping hardened concrete creates a different silica-control problem from ordinary wet placement; Section 9.1 explains the planning boundary.

5.10 Cost Considerations

For ready-mix, price the ordered quantity plus every applicable supplier term. For bags, price the whole-bag quantity plus transport, storage, mixing, labor, water/power arrangements, and equipment. In either case, include the remaining materials and site work.

Use this comparison structure:

> FORMULA
>
> **Ready-mix option = concrete + delivery/haul + small-load + add-ons + placement equipment + labor + other project costs**

> FORMULA
>
> **Bag option = whole bags + transport + mixing equipment + labor + handling/storage + other project costs**

Do not compare a per-yard ready-mix price with a per-bag shelf price and call the difference complete.

5.11 Project Size and Practicality

Quantity matters, but so do access, batch continuity, finish, available help, physical handling, supplier service, and schedule. A small inaccessible placement may favor one system; a similarly sized placement with excellent truck access may favor another. A larger volume mixed from bags may become unrealistic for the available crew, while a small ready-mix order may carry supplier charges.

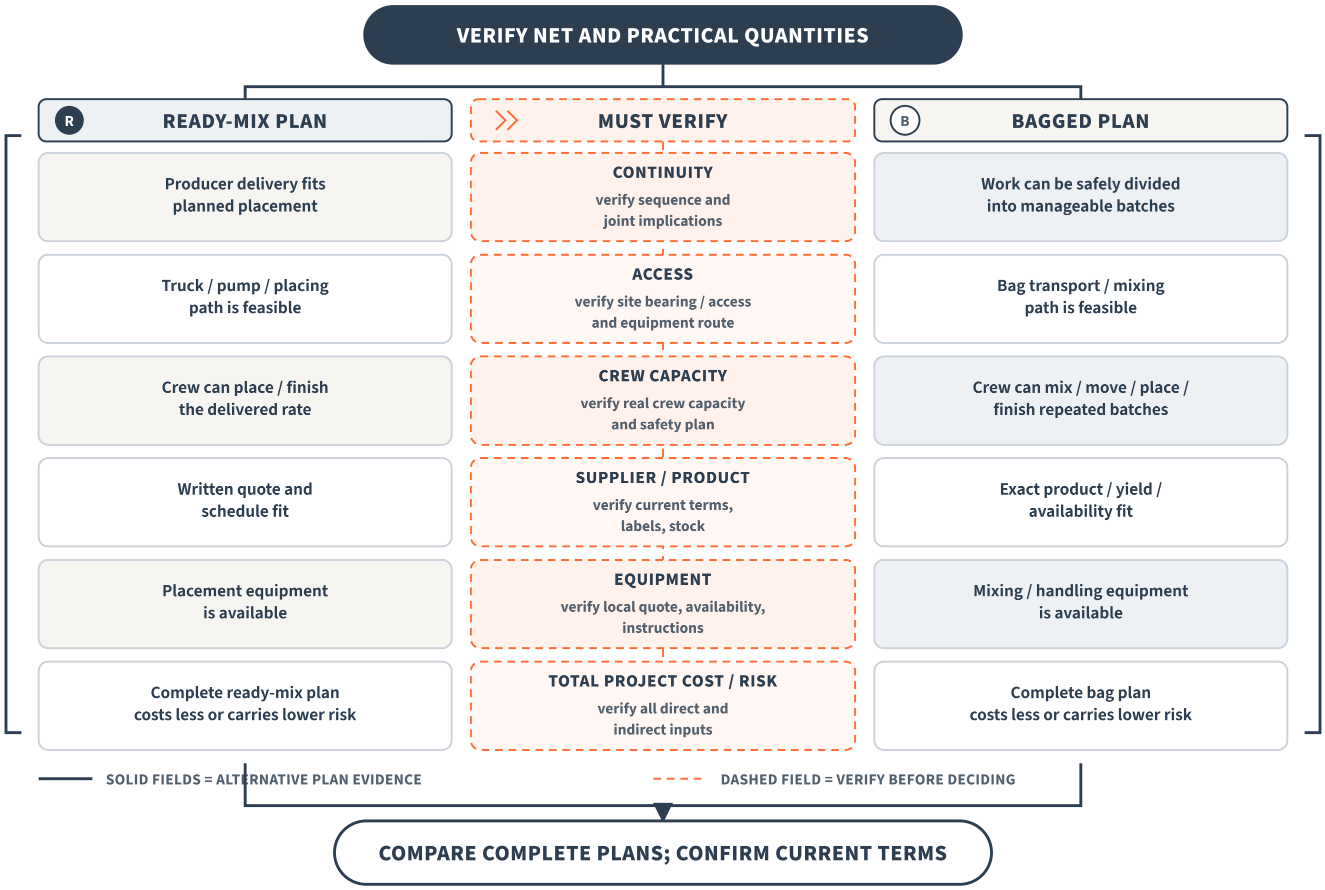
No universal volume determines the choice. Build both plans and compare them.

5.12 Decision Table — Ready-Mix vs. Bags

Decision factor	Evidence favoring ready-mix	Evidence favoring bags	Must verify
Continuous volume	Producer delivery fits planned placement	Work can be safely divided into manageable batches	Project sequence and joint implications
Access	Truck/pump/placing path is feasible	Truck access is poor but bag transport/mixing is feasible	Site bearing/access and equipment route
Crew	Crew can place/finish delivered rate	Crew can mix, move, place, and finish repeated batches	Real crew capacity and safety plan
Supplier/product	Written ready-mix quote and schedule fit	Exact product/yield/availability fit	Current terms, labels, and stock
Equipment	Placement equipment is available	Mixing/handling equipment is available	Local quote, availability, instructions
Cost	Complete ready-mix plan costs less or carries lower risk	Complete bag plan costs less or carries lower risk	All direct and indirect inputs

READY-MIX OR BAGGED? COMPARE COMPLETE PLANS

NO UNIVERSAL VOLUME OR PRICE THRESHOLD



Choose the supply method by comparing complete quantity, access, crew, equipment, continuity, supplier/product, cost, and risk plans—not by relying on one unit price or volume cutoff.

5.13 Final Supply-Method Checklist

- [ ] Document net volume and practical quantity separately.
- [ ] Base the ready-mix quote on the actual supplier, service, date, quantity, and project needs.
- [ ] Use the exact current product yield and whole-bag rounding for the bag calculation.
- [ ] Confirm that access and material movement are feasible.
- [ ] Include every task and person in the labor-hours.
- [ ] Confirm availability and obtain a local quote for required equipment.
- [ ] Review delivery, minimum, short-load, standby, and cancellation terms.
- [ ] Plan mixing, placement, finishing, curing, cleanup, and safety controls.
- [ ] Base the decision on total project effort and risk, not unit price alone.

Selected sources: Official ASTM catalog records for C94/C94M-26c and C387/C387M-23; NRMCA *CIP 31—Ordering Ready Mixed Concrete* and its “About Concrete” orientation page; the named QUIKRETE and Sakrete product documents; the named Nebraska, California, and West Michigan supplier pages; BLS labor sources; OSHA concrete and silica guidance; and Home Depot’s equipment-category page only for rental availability. Full citations and date/location limits appear in Back Matter C.

CHAPTER 06

Plan the Rest of Your Materials

> **READER OUTCOME**
> Develop a more complete material plan instead of budgeting only for concrete.

6.1 Concrete Is Only One Part of the Material List

A volume calculation answers one material question. The project may also need base or subbase, forms, reinforcement shown by the design, joint materials, vapor-control materials, curing supplies, anchors or embeds, protection, cleanup materials, and other job-specific items.

Build the list from the scope, drawings, specifications, site, sequence, and selected supply method. A generic checklist is a prompt, not a bill of materials.

6.2 Base and Subbase Materials

Base and subbase layers can support construction, drainage, uniformity, and pavement performance, but the needed material, thickness, grading, moisture, and compaction depend on soils, drainage, loading, climate, project type, and design.

FHWA base/subbase guidance in the research library is pavement-specific. It supports the principle that foundation conditions matter; it does not establish one residential depth or compaction target. Use the project documents and local/site-specific guidance.

For takeoff, record the prepared area, specified compacted thickness, material/unit, density or coverage source, compaction/loose-volume conversion source, and quote. Do not invent a density or loss factor.

6.3 Gravel and Aggregate

Supplier names such as crushed stone, gravel, sand, recycled aggregate, and numbered local product designations do not by themselves prove suitability. Confirm the required material designation and gradation, intended use, moisture condition, density/tonnage conversion, delivery unit, minimum charge, and whether the quote is pickup or delivered.

Price is local. One verified 2026 West Michigan pit list is used later only to demonstrate unit arithmetic. It is not a national base-material benchmark.

6.4 Reinforcement

Reinforcement may be used to carry forces, control crack widths, hold elements together, or meet project requirements. The correct type, grade, size, spacing, location, cover, laps, supports, and detailing are design and code matters.

Use this section to organize the takeoff, not to design reinforcement. Transfer details from current drawings and specifications, count them accurately, identify unclear conditions, and obtain qualified clarification before pricing or building.

6.5 Reinforcing Bar Planning

A rebar takeoff can be organized without choosing the design:

1. Identify each bar mark or project-defined group.
2. Record size/grade/coating exactly as specified.
3. Record quantity and cut length from the approved details.
4. Address bends, hooks, laps, couplers, dowels, supports, and fabrication as the documents require.
5. Separate stock-length planning from installed design length.
6. Obtain current fabrication/material quotes and clarify delivery.

Do not use an unverified internet chart to create cover, spacing, or lap requirements.

6.6 Wire Mesh

Welded wire reinforcement and other mesh products vary by designation, wire size, spacing, sheet or roll dimensions, and project purpose. Transfer the specified product and placement from the project documents. Plan support, overlaps, cutting, handling, and safe placement without assuming that mesh placed on the ground will end up at its intended location.

The takeoff should name the exact product, coverage basis, overlap/detail source, quantity, unit, and current supplier quote.

6.7 Forms and Form Materials

Formwork establishes shape and contains fresh concrete. Depending on the project, the material list may include form boards or panels, stakes, walers, ties, bracing, fasteners, release material, chamfer or edge strips, blockouts, and stripping/cleanup supplies.

Forms must be appropriately designed, constructed, braced, and maintained for the work. OSHA rules apply to employers, and complex or load-sensitive formwork may require qualified design. A material takeoff does not replace a formwork safety or design plan.

6.8 Control and Isolation/Expansion Joints

Different joint types serve different purposes. A contraction/control joint creates an intended location for shrinkage-related movement. An isolation joint separates the slab from another element. Construction joints address planned stops or sequencing. The term “expansion joint” is often used loosely, so the project should identify the intended function and material.

Joint layout, depth, timing, load transfer, sealant, filler, and reinforcement interaction are project/design decisions. Estimate from the current joint plan; do not apply one spacing formula to every slab.

6.9 Vapor Barriers Where Applicable

Under-slab vapor control may matter when moisture-sensitive flooring, interior conditions, or project requirements apply. ASTM E1745 addresses vapor-retarder materials and ASTM E1643 addresses installation/inspection scope, but the full current requirements and project decisions must come from lawfully accessed standards and project documents.

The takeoff may include sheet area, seams, penetrations, terminations, compatible tape and accessories, and protection. Do not choose a product or installation detail from area alone.

6.10 Curing Materials

Curing planning aims to manage moisture and temperature so the placed concrete can develop the intended properties. Possible project methods use water, coverings, sheet materials, liquid membrane-forming products, insulated protection, or combinations, subject to specifications, weather, finish, later coatings/flooring, and manufacturer compatibility.

Estimate the selected method's coverage, overlaps, application equipment, labor, protection, inspection, and replacement material. This guide intentionally gives no universal curing duration or temperature trigger.

6.11 Other Project-Specific Materials

Depending on scope, consider embeds, anchor items, sleeves, blockouts, dowels, sealants, patching materials, bonding products, curing/protection products, insulation, drainage items, washout controls, erosion controls, floor-treatment compatibility, testing supplies, and temporary protection.

The list cannot be exhaustive. Each line should point back to a drawing, specification, product instruction, site decision, or identified planning assumption.

6.12 Building a Material Takeoff

Use a consistent table:

Item	Project section	Basis/quantity	Purchase unit	Source of requirement	Quote/product source	Open issue
Concrete	Main slab	Net and practical yd^3 shown separately	yd^3 or whole bags	Measurement/calculation sheet	Producer or exact bag product	Final order confirmation
Base	Applicable area	Project-specified compacted quantity	ton, yd^3, or other supplier unit	Plans/site specification	Named supplier quote	Density/conversion and delivery

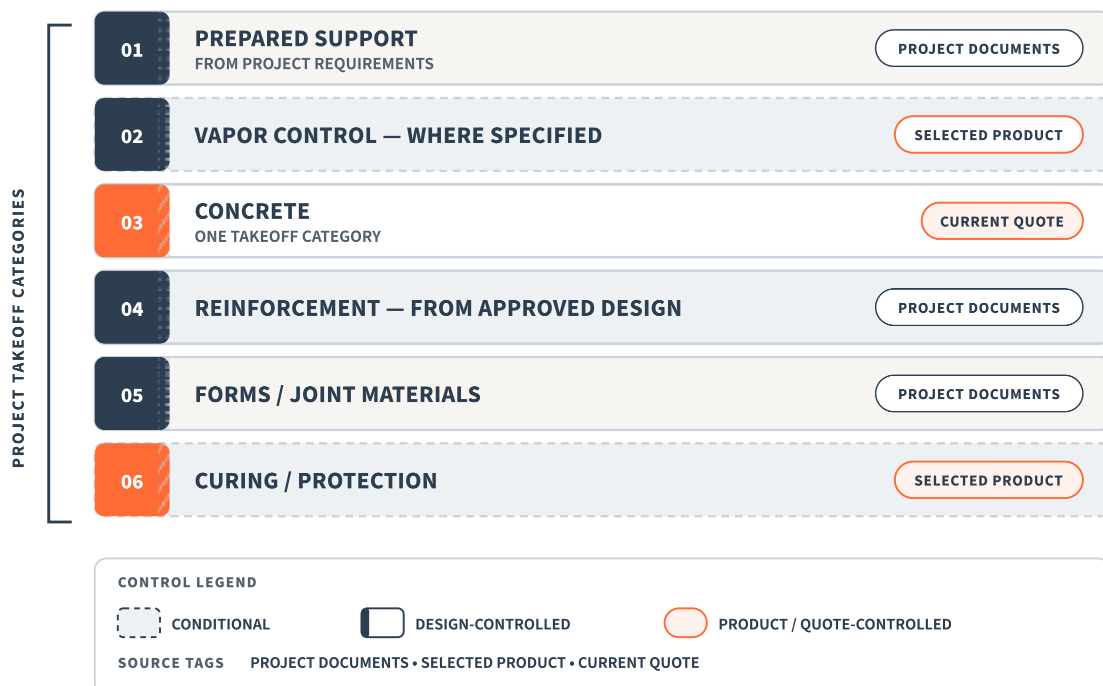
TABLE CONTINUED

Item	Project section	Basis/quantity	Purchase unit	Source of requirement	Quote/product source	Open issue
Reinforcement	Bar/mesh group	Approved takeoff	pieces, weight, sheets, rolls	Current drawings/details	Fabricator/supplier	Design clarification
Forms	Edge/element group	Measured form contact/edge quantities	pieces, sheets, linear ft	Formwork plan	Supplier/company inventory	Reuse and bracing plan
Curing	Selected method	Coverage from selected product/system	roll, gallon, piece	Project curing plan	Manufacturer/supplier	Compatibility and weather

Keep the net requirement, allowance, and purchase rounding in separate, explained quantities.

PROJECT TAKEOFF CATEGORIES

TAKEOFF CATEGORIES — NOT A CONSTRUCTION DETAIL; NOT TO SCALE



Build the takeoff from the complete project scope: concrete quantity is one line among project-controlled support, reinforcement, forms/joints, vapor-control, and curing/protection materials.

6.13 Complete Materials Checklist

- [ ] Confirm the concrete supply method, mixture or product, net volume, and practical quantity.
- [ ] Confirm base or subbase material and project-specific preparation requirements.
- [ ] Take off reinforcement from approved design documents.
- [ ] Include project-required chairs, supports, ties, couplers, and accessories.
- [ ] Include form panels or boards, stakes, ties, bracing, fasteners, and release materials.
- [ ] Include joint-layout materials, blockouts, fillers, sealants, and the cutting or forming plan.
- [ ] Include vapor-control material and compatible accessories where specified.
- [ ] Select curing and weather-protection materials for the project.
- [ ] Include embeds, anchors, sleeves, dowels, insulation, and drainage items.
- [ ] Include cleanup, washout, environmental, and temporary-protection materials.
- [ ] Confirm quantities, purchase units, availability, lead times, and current quotes.
- [ ] Assign unresolved design or product issues for clarification.

Selected sources: FHWA-HIF-16-005 for bounded pavement base/subbase principles; ACI slab, joint/reinforcement, and curing guides; official ASTM catalog records for E1643-24 and E1745-17(2023); NRMCA CIPs 6 and 29; OSHA concrete/masonry rules; and *UFS 3-740-05* and GAO-20-195G for takeoff discipline. Full citations and scope limits appear in Back Matter C.

CHAPTER 07

Build a Realistic Concrete Project Estimate

READER OUTCOME

Build an estimate that accounts for the major cost categories rather than relying on concrete price alone.

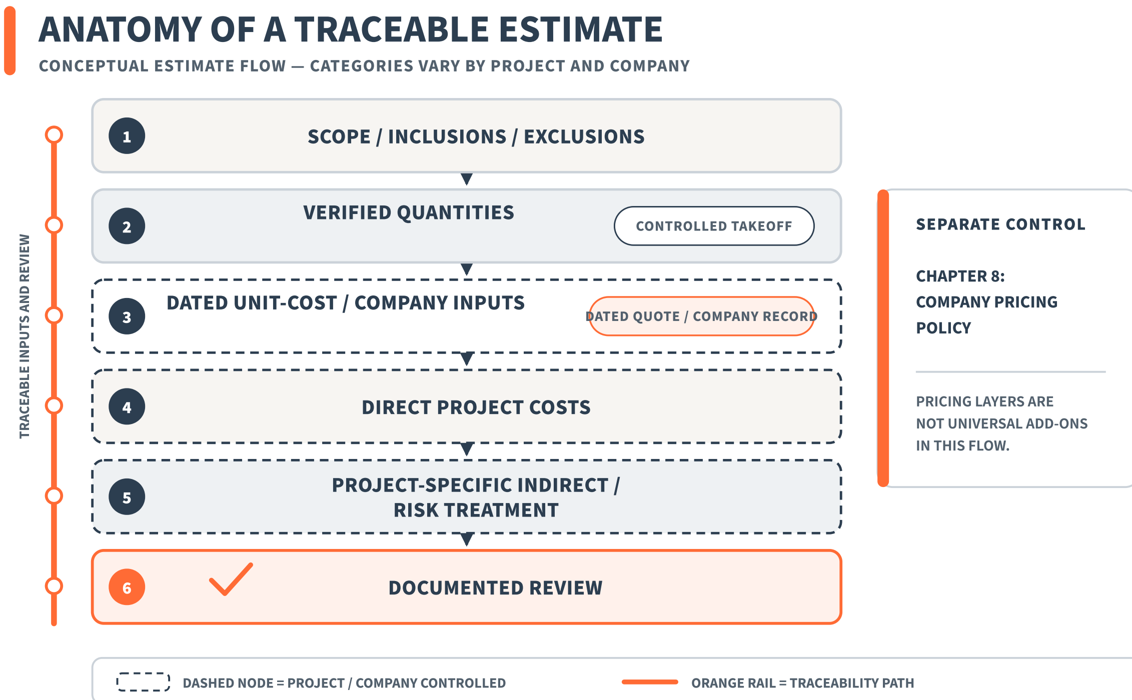
7.1 What a Project Estimate Should Include

A project estimate should state its inclusions, exclusions, quantity basis, current price sources, labor and equipment assumptions, risk treatment, and the date and location of market inputs.

Organize costs so a reviewer can trace them:

- concrete and other materials;
- delivery and supplier charges;
- direct labor;
- equipment;
- reinforcement and formwork;
- site preparation, placement, finishing, curing, and cleanup;
- other direct project costs;
- project-specific indirect costs; and
- documented risk/uncertainty treatment.

Federal UFS and GAO sources support disciplined scope, quantities, assumptions, risk, and review. Their agency procedures are not requirements for ordinary private work.



A traceable estimate starts with controlled scope and quantities, extends them with dated or documented inputs, separates cost layers, and ends with a recorded review.

7.2 Start With a Quantity Takeoff

Price follows quantity. For each line, retain:

> FORMULA
>
> quantity × unit cost = extended cost

The quantity should trace to a measurement, calculation, approved design detail, product coverage, or supplier conversion. The unit cost should trace to a dated quote, company record, or clearly labeled hypothetical teaching input.

Separate net quantity, allowance, purchase rounding, and quote quantity. That makes later changes easier to update.

7.3 Concrete Cost

For ready-mix:

> FORMULA
>
> Concrete material cost = quoted order quantity × quoted unit price

Then add applicable delivery/haul, short-load, seasonal, material add-ons, pumping, standby, tax, or other quote terms as separate lines.

For bags:

> FORMULA
> **Bag material cost = whole-bag quantity × current price for exact SKU/location**

No bag retail price is included in this guide because a publishable named local price set was not established.

7.4 Other Material Costs

Price base, forms, reinforcement, joints, vapor control, curing, protection, embeds, and consumables from the project takeoff. Record units carefully: dollars per ton are not dollars per cubic yard; dollars per sheet are not dollars per square foot; pickup prices are not delivered prices.

If a current quote is unavailable, keep the line as **quote required** rather than inserting a national average.

7.5 Delivery and Short-Load Costs

Delivery costs are supplier and service specific. Treat every charge as its quoted unit: per load, per mile, per zone, per yard, per hour, or fixed minimum. Confirm included unloading time and when standby/demurrage begins. Do not combine policies from different suppliers into one fictional national schedule.

7.6 Labor Cost

Estimate labor from tasks and labor-hours:

> FORMULA
> **Labor-hours = number of workers × hours worked per worker**

> FORMULA
> **Direct labor cost = labor-hours × company loaded labor cost per hour**

The rate in the second formula is not automatically an employee wage, a BLS mean, or a customer billing rate. Chapter 8 separates those layers.

7.7 Equipment Cost

For rented equipment, use a current written local quote that matches the exact equipment, rental period, delivery/pickup, availability, taxes, damage waiver, fuel/cleaning, and other terms.

For owned equipment, build a company method using ownership, maintenance, fuel, transport, insurance, storage, and realistic utilization. No universal hourly rate applies.

Equipment pricing therefore remains a local-quote input instead of an arbitrary example rate.

7.8 Reinforcement Cost

Price the approved reinforcement takeoff, fabrication, accessories, delivery, handling, and installation labor. Keep design quantities separate from stock/purchase quantities and document waste/cut planning. Do not choose reinforcing size or spacing for cost convenience.

7.9 Formwork Cost

Include form materials, fabrication, bracing/ties, release material, installation, inspection where required, stripping, cleaning, and disposal or reuse. If reusable company-owned forms are allocated across jobs, document the company policy rather than charging the full purchase cost and a reuse allocation at the same time.

7.10 Site Preparation Cost

Possible lines include layout, clearing, excavation, grading, base, compaction, drainage work, hauling, disposal, access preparation, erosion controls, and restoration. Soil and disposal conditions can dominate the cost. Use site review and current local quotations.

7.11 Finishing Cost

Finishing cost depends on geometry, access, mixture, weather, finish specification, edges/joints, equipment, crew skill, sequence, and quality expectations. Use company history or a subcontractor quote for the actual scope; do not apply a national square-foot rate from an unaudited page.

7.12 Other Direct Costs

Other direct costs may include mobilization specific to the project, testing, pumping, temporary protection, curing, cleanup, washout, traffic control, permits, inspection fees, survey/layout, and project-specific supervision. Include a category only when it belongs to the defined scope.

7.13 Allowances for Risk and Uncertainty

Risk treatment should follow identified uncertainty. Record the risk, likelihood/impact reasoning, responsible person, and how the estimate addresses it. Possible treatments include clarifying scope, obtaining another quote, measuring again, changing the plan, carrying a separately identified allowance, or excluding the item with a clear qualification.

A contingency percentage is not universally correct. Do not use one to hide incomplete takeoff work.

7.14 Why Location and Timing Affect Prices

Material availability, plant/service area, haul distance, fuel and seasonal conditions, labor market, taxes, permits, demand, project access, quantity, delivery timing, and supplier terms can change price. A dated supplier sheet is a snapshot, not a future quote.

Each published example should identify its source, geography or service area, effective or retrieval date, unit, customer class where relevant, and known exclusions.

7.15 Worked Project Estimate

This worked example demonstrates estimate structure. It combines two **West Michigan 2026 public list examples** with clearly identified fictional company/project inputs. It is not a market price, bid, or recommended cost.

Scenario assumptions

- Ready-mix order: 3.5 yd^3 using the supplier's public "3500" mix label solely as a price-list identifier—not a strength recommendation.
- Grand Rapids Gravel/Port City/Kalkman list price effective 2026-01-01: $202/$yd^3$.
- Published **minimum haul charge** for the 3.25–4.75 yd^3 quantity band: $110/load.
- Base example: 2.0 tons of Woodworth Pit "31A" at $33.50/ton, plus the published $5/ton addition for non-contractors under 10 tons; product suitability and delivery still require confirmation.
- All other figures are fictional internal inputs used only to demonstrate arithmetic.

Cost line	Basis	Extended cost	Evidence type
Concrete	3.5 yd^3 × \$202/yd^3	$707	Verified supplier list; West Michigan; effective 2026-01-01
Minimum haul charge	Supplier's 3.25–4.75 yd^3 quantity band	$110	Same verified supplier list/date
Base material	2.0 ton × ($33.50 + $5.00)/ton	$77	Verified Woodworth Pit public list; accessed 2026-08-29
Forms/fasteners	Project quote input	$96	Fictional teaching input—replace with quote
Curing/protection	Product quote input	$42	Fictional teaching input—replace with quote
Direct labor	18 labor-hours × $46/hour	$828	Fictional company loaded-cost input
Equipment	Local quote input	$185	Fictional teaching input—replace with current quote
Other direct cost	Fictional project input	$35	Fictional teaching input
Documented project risk allowance	Fixed response to identified scenario risk	$150	Fictional management input; not a standard percentage
Planning total	Sum of listed lines	**$2,230**	Teaching result only

Supporting calculations:

- Concrete: 3.5 × $202 = $707
- Base: 2.0 × ($33.50 + $5.00) = $77
- Labor-hours: 3 workers × 6 hours = 18 labor-hours
- Loaded labor: 18 × $46 = $828
- Total: $707 + $110 + $77 + $96 + $42 + $828 + $185 + $35 + $150 = $2,230

The example excludes tax and any unlisted supplier/project charges. Obtain current written quotes and replace every fictional input before use.

7.16 Estimate Review Checklist

- [ ] State the scope, inclusions, exclusions, estimate date, and location.
- [ ] Trace every cost line to a quantity and unit.
- [ ] Distinguish net, allowance, purchase, and order quantities.
- [ ] Identify source, date, geography, and terms for supplier and product quotes.
- [ ] Separate delivery, minimum, haul, standby, tax, and add-ons where applicable.
- [ ] Use labor-hours and a documented company labor cost—not a mislabeled wage.
- [ ] Use a current equipment quote or documented ownership method.
- [ ] Follow approved project details for reinforcement and formwork.
- [ ] State each risk item and response explicitly.
- [ ] Label fictional and placeholder inputs, and replace them before a real bid.
- [ ] Independently check arithmetic and units.
- [ ] Schedule quote-expiration checks and final supplier and owner review.

Selected sources: *UFS 3-740-05* (2026) as information-only federal estimating guidance; GAO-20-195G; the named Nebraska, California, and West Michigan supplier pages; BLS labor sources; NRMCA *CIP 31—Ordering Ready Mixed Concrete*; and Home Depot's equipment-category page only for rental availability. Full citations and date/location limits appear in Back Matter C. No federal or DoD procedure is presented as a private-project requirement.

CHAPTER 08

Labor, Equipment, Overhead, Markup & Profit

READER OUTCOME

Understand how contractors move from direct project costs toward a selling price without confusing wages, overhead, markup, margin, and profit.

8.1 Understanding Labor Hours

Labor-hours measure total human time:

FORMULA

Labor-hours = workers × hours per worker

Three workers each spending six hours produce $3 \times 6 = 18$ labor-hours. They may complete the work in six clock hours, but the estimate carries 18 hours of labor cost.

Break the estimate into tasks and use company history where available. Crew size and productivity are project-specific; no national rate can account for every access route, finish, weather condition, or skill mix.

8.2 Employee Wage vs. Loaded Labor Cost vs. Customer Billing Rate

These layers must remain separate:

Layer	What it means	What it does not mean
Employee wage	Pay attributed to the employee's work time	The employer's complete labor cost or customer price
Labor burden	The company-specific employer-paid payroll, insurance, benefit, paid-time, and related components added to wage under a defined method	A universal percentage, employee wage, or customer price
Loaded labor cost	Employee wage plus the company's defined labor burden	A universal multiplier or market billing rate
Contractor cost allocation	Loaded labor plus any project/company allocation assigned by policy	Automatically the same for every business
Customer billing or selling rate	Commercial price charged to the customer	A BLS wage or guaranteed profit

The May 2025 national BLS OEWS snapshot reported mean employee wages of $28.87/hour for cement masons/concrete finishers and $25.02/hour for construction laborers. Those are national employee-wage statistics, not loaded cost or customer billing rates.

The March 2026 BLS ECEC snapshot for the broad private-construction industry reported $35.54/hour in wages/salaries and $15.69/hour in benefits, totaling $51.23/hour. That is industry-wide employer compensation, not a concrete occupation or a specific company's burden. The arithmetic check is 35.54 + 15.69 = 51.23.

Hypothetical company illustration: If a company records a $30/hour wage and $16/hour in applicable employer-paid components for one labor category, its loaded cost in that scenario is $46/hour. For 18 labor-hours, 18 × $46 = $828. These are fictional inputs, not BLS conversions or market rates.

8.3 Estimating Crew Requirements

Start with tasks, sequence, access, safety controls, delivery/placement plan, finish, and available skill—not a generic crew table. Identify roles and where simultaneous work is required. Then test whether the crew can sustain the planned material flow without unsafe rushing or unplanned waiting.

Employers must plan applicable OSHA controls and competent-person or qualified-person responsibilities where required. An estimating crew plan does not replace a safety plan.

8.4 Equipment Rental and Ownership Costs

For a rental:

> FORMULA
>
> **Rental cost = quoted base period + delivery/pickup + applicable fees + consumables + tax + extension exposure**

Use the actual local quote. The official rental category page reviewed for this edition did not provide one static national price, so this guide supplies no rental rate.

For owned equipment, a company may consider depreciation or lease cost, cost of capital, insurance, maintenance, repairs, wear parts, fuel/power, transport, storage, and utilization. The allocation method should match company accounting and avoid charging the same cost twice.

8.5 Direct Costs

Direct costs can be traced to the particular project. Depending on scope, they may include concrete, base, reinforcement, forms, project labor, equipment used on the job, delivery, site preparation, placement, finishing, curing, testing, permits, and cleanup.

"Direct" describes traceability, not importance. Company accounting policy should define the categories consistently.

8.6 Indirect Costs

Indirect costs support the project or business but are not readily traced to one installed unit. Examples may include project supervision, mobilization, temporary facilities, shared small tools, office administration, estimating, insurance allocation, software, vehicles, and general business operations.

Some businesses treat a cost as direct that another treats as indirect. Consistency and documentation matter more than copying a universal list.

8.7 What Contractor Overhead Means

Overhead is the cost of keeping the business capable of performing work. It may include office, management, estimating, accounting, insurance, licensing, software, vehicles, facilities, and other continuing costs, depending on the company's accounting method.

Overhead is not automatically profit. A selling price that recovers direct job cost but ignores legitimate overhead can still lose money. No universal overhead percentage fits every contractor.

8.8 What Markup Means

Markup is an amount added to a cost base. If C is the defined cost base and m is the markup rate:

> FORMULA
>
> **Selling price = C × (1 + m)**

> FORMULA
>
> **Markup dollars = selling price − C**

The company must define what is already inside C and what the markup is intended to cover. A markup on direct cost may need to cover indirect cost, overhead, risk, and profit; a markup on a fully loaded cost base may serve a different purpose.

8.9 What Profit Means

Estimated profit is the amount expected to remain after the costs included in the company's calculation. Realized profit is known only after actual revenue and costs are recorded.

A number labeled "profit" may actually include unrecovered overhead if the cost base was incomplete. State the cost basis before judging the result.

8.10 Markup vs. Margin

Markup and margin use different denominators:

> FORMULA
>
> **Markup = (selling price − cost) ÷ cost**

> FORMULA
>
> **Margin = (selling price − cost) ÷ selling price**

With a fully defined cost base of $2,400 and a selected 20% markup:

- Selling price: $2,400 × 1.20 = $2,880
- Amount above cost: $2,880 − $2,400 = $480
- Margin: $480 ÷ $2,880 = 16.67%

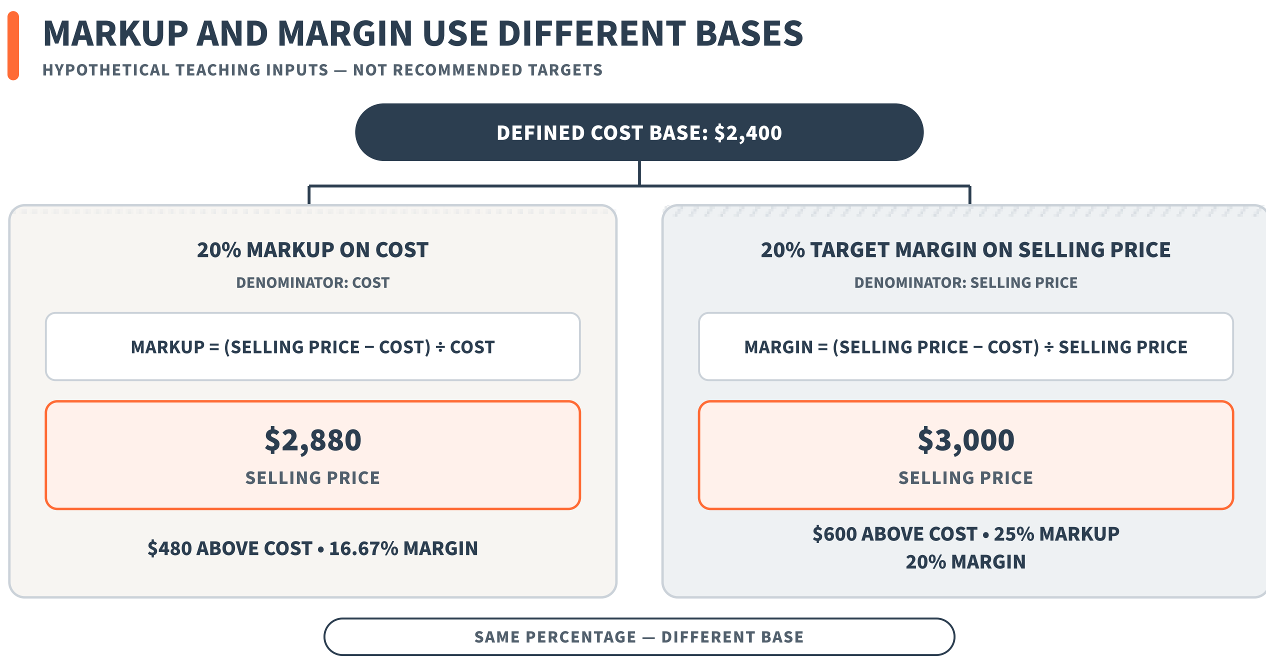
A 20% markup does **not** produce a 20% margin.

If the company instead selects a 20% target margin on the same cost base:

> FORMULA
>
> Selling price = cost ÷ (1 − margin)

> FORMULA
>
> $2,400 ÷ (1 − 0.20) = $3,000

The amount above cost is $600, which equals a 25% markup on cost and a 20% margin on selling price. These rates are hypothetical teaching inputs, not recommendations.



Markup uses cost as its denominator; margin uses selling price. The same 20% input therefore produces different selling prices and different percentages above cost.

8.11 Avoiding Double Counting

Double counting occurs when the same cost appears in more than one place—for example, a vehicle cost inside a loaded labor rate and again as an equipment line, or supervision in project indirects and overhead.

For each line, ask:

1. What cost does this line represent?
2. Is it already included in a unit rate, burden, allocation, or markup?
3. Does company policy classify it as direct, project indirect, or business overhead?
4. Will the same dollar be recovered elsewhere?

Use one cost map consistently from estimate through job-cost review.

8.12 Building a Contractor Selling Price

A transparent sequence is:

1. Build direct project cost.
2. Add project-specific indirect cost according to company policy.
3. Add or allocate business overhead according to company policy.
4. Address identified risk without duplicating it.
5. Apply the company's chosen pricing/profit method.
6. Review market/customer terms without mislabeling the cost basis.

No book can select a contractor's overhead, markup, margin, or profit target. Those are company decisions informed by accounting, capacity, risk, market, and strategy.

8.13 Worked Contractor Pricing Example

Continue the fictional teaching estimate from Chapter 7:

Step	Calculation	Amount
Direct/project estimate including its documented risk line	From Chapter 7	$2,230
Allocated company overhead for this simplified scenario	Fictional company input	$170
Fully loaded cost base	$2,230 + $170	**$2,400**
Selected profit markup on that defined base	$2,400 × 20%	$480
Proposed selling price	$2,400 + $480	**$2,880**
Resulting margin	$480 ÷ $2,880	**16.67%**

The example assumes the $170 allocation completely represents the company overhead assigned under its fictional policy; an actual business must use its accounting data. The 20% markup is an arbitrary teaching input, not an industry benchmark. Unplanned cost would reduce realized profit.

8.14 Final Pricing Review

- [ ] Confirm that the scope and estimate basis are current.
- [ ] Use company data for labor-hours and loaded labor cost.
- [ ] Label employee wages, employer cost, contractor cost, and customer price correctly.
- [ ] Use a current equipment quote or documented ownership method.
- [ ] Define direct, indirect, overhead, risk, and profit categories.
- [ ] Remove any double-counted cost.
- [ ] Use the correct denominator in markup and margin formulas.
- [ ] Treat percentages as company decisions, not unsupported industry standards.
- [ ] Review taxes, payment terms, bonds, insurance, warranty, schedule, exclusions, and change procedures as applicable.
- [ ] Obtain authorized company approval for the selling price.

Selected sources: BLS May 2025 national Occupational Employment and Wage Statistics; BLS March 2026 private-construction Employer Costs for Employee Compensation; *UFS 3-740-05* and GAO-20-195G for general estimating/cost principles; and Home Depot's equipment-category page only for rental availability. Full citations appear in Back Matter C. Company cost, productivity, billing, overhead, markup, margin, and profit decisions remain project/company specific.

CHAPTER 09

Plan the Pour Before the Truck Arrives

READER OUTCOME

Coordinate materials, people, access, timing, placement, finishing, and curing before concrete arrives.

9.1 Pre-Pour Planning

The pre-pour plan connects the estimate to the field. It confirms that the site, forms, base, reinforcement, embeds, materials, labor, equipment, access, delivery, weather response, placement sequence, finish, curing, cleanup, and safety controls are ready for the same scope.

Hold a review while corrections are still possible. Assign each open item to a person and identify the point at which work must stop if it remains unresolved.

Safety baseline for this guide

OSHA requirements govern employers and employees; the employer safety program, competent-person duties, task plan, and current regulations control that work. This book does not give homeowners an employer compliance plan, but they still need to recognize the same physical hazards and follow current product, equipment, utility-location, and local requirements. Stop and obtain qualified help when the available knowledge, people, or equipment cannot control a hazard.

Hazard area	Plan before work begins
Wet concrete and cement products	Review the label and safety data sheet. Provide task-appropriate waterproof gloves and boots, protective clothing, eye or face protection, washing facilities, and first-aid response. Wet cementitious material is caustic: avoid skin and eye contact, do not kneel in wet concrete, remove contaminated clothing, and follow the product's exposure and first-aid directions promptly.
Dry-product dust and silica-generating work	Identify every dust-producing task. Opening or mixing dry product differs from cutting, grinding, drilling, or chipping hardened concrete. Employers need task-appropriate exposure controls. A generic dust mask is not a complete plan; use the engineering and work-practice controls, equipment instructions, restricted access, housekeeping methods, and any respiratory protection required under the applicable hazard assessment and program.
Excavation and underground services	Complete the applicable utility-location or one-call process before excavation. Address cave-in, access, water, nearby-structure, and mobile-equipment hazards. Do not enter or work beside an excavation until its protective needs have been evaluated.
Trucks, pumps, and mobile equipment	Coordinate the route with the supplier. Assign one person to direct movement and communication. Confirm clearance and bearing support, and establish an exclusion area around blind spots, moving equipment, suspended loads, and pressurized placement systems.
Forms and reinforcement	Confirm required design and inspection of forms and supports. Control exposed reinforcing ends, unstable or stored material, and movement during placement. Project-appropriate impalement protection is a safety control, not a structural design detail.

TABLE CONTINUED

Hazard area	Plan before work begins
Lifting, tools, and electricity	Plan mechanical help or team handling for heavy loads. Use required guards and manufacturer instructions. Confirm that cords, tools, lighting, and temporary power suit the wet work area, and keep people clear of suspended or uncontrolled loads.

Assign each control to a responsible person, stage it before the pour, and define the stop-work signal. Checklists later in this chapter use these plain-language hazard categories rather than unexplained shorthand.

9.2 Site Access

Trace the full route from public road or unloading point to the placement. Check width, height, turning, grade, surface condition, overhead obstructions, underground services, traffic, pedestrians, neighboring property, and the condition of driveways or shoulders.

Confirm the access plan with the producer and any pump or equipment provider. A planner should not assume a heavily loaded truck can drive wherever a passenger vehicle can. Establish a safe staging and communication method before arrival.

Mark the vehicle route and exclusion area, control pedestrians, and designate one person to coordinate movements with the driver or equipment operator. The supplier and site controller should agree on signals and stopping points before a truck or pump moves into position.

9.3 Excavation and Subgrade Preparation

Verify layout, elevation, excavation limits, bearing/subgrade condition, drainage, disturbed areas, soft spots, utilities, and disposal. Before opening the excavation, complete the applicable utility-location or one-call process and resolve required markings, clearances, and owner notifications. Compare actual field conditions with the project requirements. Resolve unsuitable or unexpected soil through the appropriate project authority rather than hiding it with additional concrete.

Excavation and soil work can create cave-in, equipment, access, and utility hazards. Applicable OSHA and local requirements, competent-person duties, and safe means/methods must be planned by the responsible parties.

9.4 Base Preparation

Confirm the specified base material, prepared limits, compacted thickness, grading, moisture/compaction process, elevations, and drainage. Do not rely on a generic depth or a casual field test as a universal acceptance method.

Re-measure concrete depth after the base is complete. The quantity calculation should describe the finished space between prepared base and final surface, not an earlier excavation assumption.

9.5 Forms

Check form location, dimensions, elevation, line, grade, stability, bracing, tightness, openings, blockouts, release treatment, access, and removal plan. Confirm that forms will contain the fresh concrete and support the planned placement sequence.

Formwork design and safety can require qualified oversight. Employers must follow applicable current requirements; this section does not calculate fresh-concrete pressure or bracing capacity.

Keep unauthorized people out of the formwork/placement zone. Assign a competent or qualified person where the work requires one, and establish who will monitor movement, leakage, bracing, and access during placement and order a stop if conditions change.

9.6 Reinforcement

Compare installed reinforcement with the latest approved drawings and details. Confirm identity, quantity, position, support, clearances, laps/couplers, dowels, embeds, cleanliness/condition, and inspection status as the project requires.

Do not move, omit, add, or redesign reinforcement to make placement easier without authorized project direction. The ebook provides no universal bar size, spacing, cover, or lap.

Plan safe storage and handling, maintain clear walking routes, and provide project-appropriate protection from exposed reinforcing ends and other impalement hazards. A makeshift cover that cannot resist the actual exposure should not be treated as adequate protection.

9.7 Crew Planning

List the tasks in sequence and assign responsible people: delivery communication, directing equipment, placing, moving, consolidating where required, screeding, edging/joint execution, finishing, curing setup, testing coordination, cleanup, and documentation.

Confirm that the planned material flow matches real crew and equipment capacity. Establish who can pause work and who makes mixture, weather, finish, or project decisions. Provide task-specific training and safety controls.

The crew briefing should cover the wet-concrete exposure response, dust/silica tasks, lifting plan, equipment and truck exclusion areas, communication signals, emergency contacts, and the stop-work rule. Employers must integrate those topics into their applicable written programs and training rather than relying on this paragraph.

9.8 Tools and Equipment

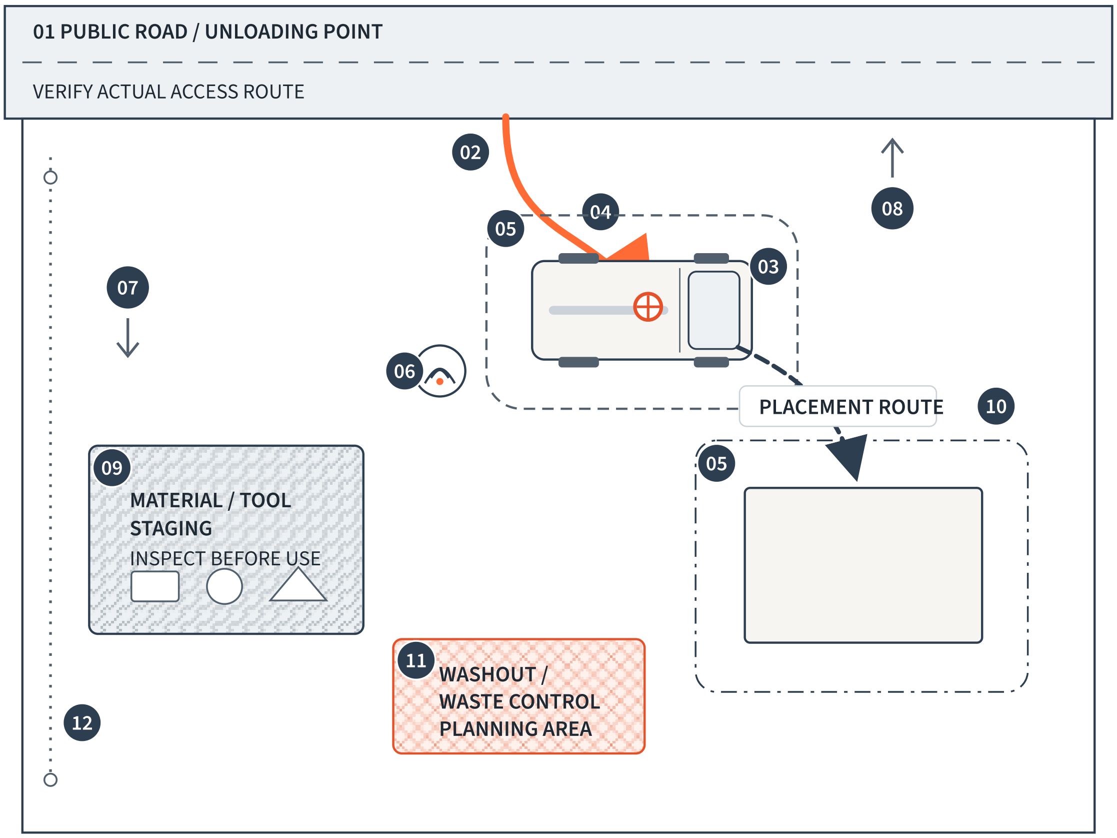
Inspect and stage the tools selected for the project. Depending on scope, the plan may address measuring/layout tools, excavation/base equipment, form tools, mixer or delivery equipment, pumps/conveyors/buggies, screeds, consolidation tools, finishing tools, joint tools, curing equipment, lighting, power, water, backups, cleanup, and required safety equipment.

Use manufacturer instructions and current local availability. A checklist cannot determine the proper tool or PPE for every task.

Identify guards, operating clearances, hose or line hazards, wet-location electrical controls, fuel/ventilation needs, and lockout or shutdown steps that apply to the selected equipment. Inspect before use and remove damaged or unsuitable equipment from the plan.

GENERIC PRE-POUR SITE COORDINATION

GENERIC PLANNING SCHEMATIC — NOT A SITE, TRAFFIC-CONTROL, EQUIPMENT-SETUP, OR SAFETY PLAN; NOT TO SCALE



COORDINATION PROMPTS

- 01 PUBLIC ROAD / UNLOADING POINT **VERIFY ACTUAL ACCESS ROUTE**
- 02 VERIFY CLEARANCE, TURNING, GRADE, SURFACE, TRAFFIC, AND PROPERTY LIMITS
- 03 CONFIRM WITH SUPPLIER / PROVIDER
- 04 MOVEMENT ROUTE AGREED STOPPING POINT
- 05 EXCLUSION AREA PEOPLE / EQUIPMENT BOUNDARY
- 06 COMMUNICATION / SPOTTER PROJECT-ASSIGNED COMMUNICATION AND STOP CONTROL
- 07 UNDERGROUND-SERVICE / UTILITY-LOCATION CHECK
- 08 OVERHEAD HAZARD CHECK
- 09 MATERIAL / TOOL STAGING INSPECT BEFORE USE
- 10 PLACEMENT ROUTE
- 11 WASHOUT / WASTE CONTROL PLANNING AREA
- 12 PEDESTRIAN / UNAUTHORIZED-PERSON BOUNDARY

Coordinate the actual access route, delivery position, placement path, crew boundaries, staging, hazards, communication, and washout controls with the responsible project and supplier parties before arrival.

9.9 Ready-Mix Delivery Timing

Coordinate the requested sequence with the producer, placement plan, crew capacity, site access, testing, and weather. Confirm the quote/order details and the producer's current policies for arrival communication, included unloading time, standby, rejected or returned material, load spacing, cancellations, and changes.

This guide intentionally gives no universal delivery or discharge minute limit. Current project specifications, producer requirements, mixture conditions, and lawfully accessed standards control.

9.10 Weather Considerations

Review the current site-specific forecast and measured conditions for the entire operation—not only the expected start. Consider temperature trend, sun, wind, humidity, precipitation, ground/form condition, material temperatures where relevant, crew exposure, evaporation risk, freezing risk, and the ability to protect the work.

Hot- and cold-weather plans are conditions-based. Current ACI guidance, project documents, producer recommendations, selected products, and qualified judgment should establish specific controls. Do not reduce weather planning to one national temperature cutoff.

9.11 Placement Planning

Plan where placement begins, how it advances, how concrete reaches every area, where equipment and people stand, how interruptions are handled, and how the placed material is protected from contamination or segregation. Confirm the plan can reach deep, narrow, congested, sloped, or remote sections.

Placement means and methods depend on the mixture, geometry, reinforcement, forms, weather, and project requirements. Resolve them with the responsible contractor/producer/design team.

9.12 Finishing Planning

Identify the required finish, tolerances, edges, surface drainage, joint execution, access, equipment, sequence, lighting, and protection. Confirm who decides when each operation proceeds.

Do not use added water or other unsanctioned field changes to solve a finishing problem. Surface operations must suit the actual mixture and conditions. Specialized finishes and tolerance requirements may require experienced personnel and project-specific procedures.

9.13 Initial Curing

Initial curing links placement and finishing to the final curing system. Its purpose is to limit premature moisture loss and maintain favorable temperature conditions while the surface is still vulnerable. The curing plan should be ready before placement and identify both the temporary measure, if needed, and the final method that follows.

Before the pour, assign the person who will watch the surface and weather, decide when the selected method can begin under the project procedure, and confirm the handoff from finishing to curing. The method must address the full exposed surface, edges, corners, penetrations, and areas that are easy to miss without damaging the finish.

Stage sufficient materials, application equipment, water or power where applicable, protection, and backups. Check compatibility with finishes, coatings, flooring, appearance, and later work. During the handoff, inspect for drying, displaced coverings, missed areas, wind damage, or delayed access; correct an interruption promptly under the approved method and record what happened.

9.14 Final Curing

Final curing is the sustained moisture-and-temperature-management system after the surface can receive the selected method. Depending on the project, that system may involve water, moisture-retaining coverings or sheets, a compatible membrane-forming product, forms left in place where appropriate, thermal protection, or a coordinated combination. Selection belongs to the project specification, responsible contractor/designer, producer, and product instructions—not to a generic preference.

The plan should state what "continuous" means for the chosen system: who inspects it, what condition shows that coverage or protection has failed, how edges and repairs are handled, what records are kept, and who may authorize a change or removal. Record weather, inspections, product/application information, damage, repairs, and interruptions. A torn sheet, dry gap, washed-off application, displaced blanket, or unprotected edge is a condition to correct, not merely a note for closeout.

Continue and monitor the approved curing/protection plan for the duration established by the project specification, mixture, method, exposure, conditions, and qualified decision. Compatibility matters: a curing material or residue can affect later appearance, coating, flooring, adhesion, or cleanup, so confirm the downstream work before choosing the method.

Do not put every project on the same curing calendar. Curing, opening to use, form removal, loading, coating, and acceptance are separate decisions that may have different controlling requirements.

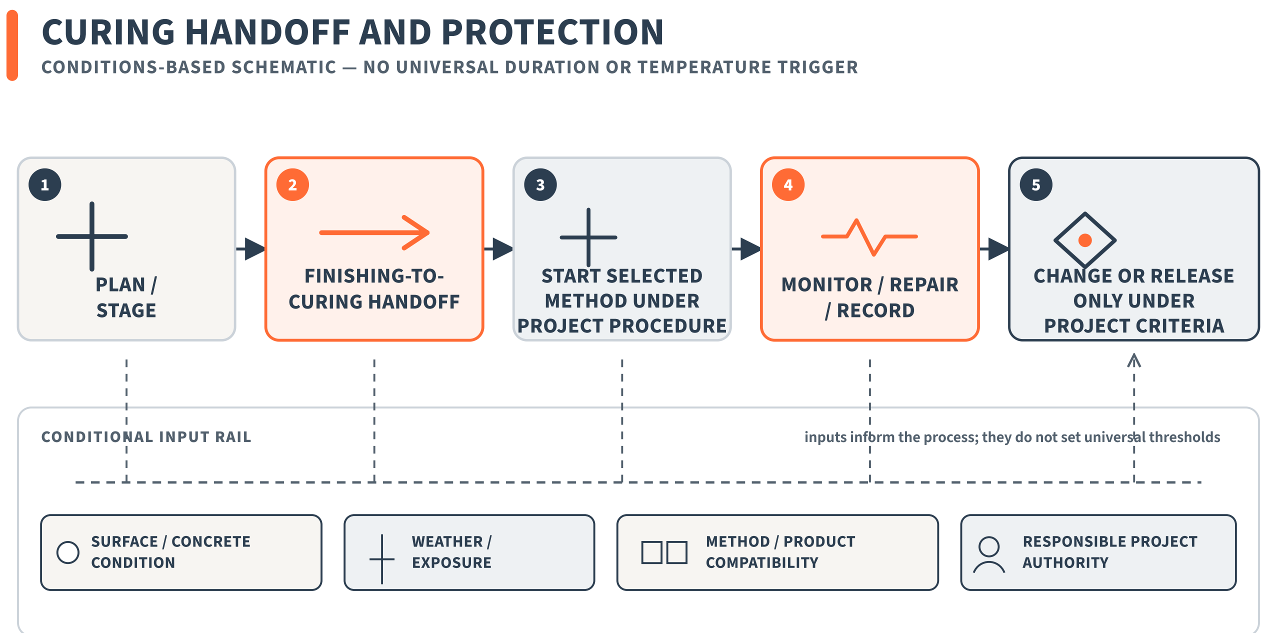
9.15 Temperature Considerations During Curing

Temperature protection and moisture management work together. Monitor the concrete and the environment at locations that represent the actual exposure, including vulnerable edges and corners where appropriate, and retain the observations required by the project plan. Air temperature alone may not describe surface conditions or the effectiveness of a covering, enclosure, or insulation system.

Hot, dry, sunny, or windy conditions can increase early moisture-loss risk even when one weather reading does not appear extreme. The response may require earlier staging, shorter handoffs between finishing and curing, wind or sun protection, closer inspection, and prompt repair of disturbed coverage. The responsible parties should select those actions from current project guidance rather than from one national temperature trigger.

Cold conditions can slow strength development and expose young concrete to freezing or damaging temperature changes. The project plan should identify the protection system, monitoring locations, acceptance/removal authority, backup response, and the separate evidence required before forms are removed or loads/use are allowed. Do not remove protection merely because the air warms briefly.

Do not improvise heaters, enclosures, water, coverings, or curing compounds. Check fire, combustion-gas, ventilation, electrical, moisture, finish, and product-compatibility hazards; follow equipment/manufacturer instructions; and avoid abrupt changes that the project's qualified plan has not addressed.



Curing is a planned handoff that stages the selected method, monitors continuity and compatibility, repairs interruptions, records conditions, and changes or ends only under project criteria.

9.16 Building a Simple Project Schedule

Use dependency-based milestones instead of promising universal durations:

Milestone	Must be complete before it begins	Hold point/output
Scope/design release	Required decisions and approvals	Approved project information
Site/base/form readiness	Layout, excavation, base, forms	Field readiness record
Reinforcement/embed review	Approved details and installation	Inspection/authorization where required
Supply confirmation	Quantity, mixture/product, quote, access	Written order/product plan
Pre-pour release	Crew, equipment, weather, curing, safety	Go/no-go decision
Placement/finishing	Accepted delivery/product and ready site	Work records and exceptions
Curing/protection	Approved method and materials staged	Monitoring record
Use/closeout	Project-specific acceptance/loading criteria	Final review and retained documents

Assign dates only after suppliers, project requirements, inspections, crew, and current conditions are known.

9.17 Pre-Pour Checklist

- [ ] Make the latest scope, drawings, specifications, permits, and inspection requirements available.
- [ ] Confirm site access and the placement route with affected suppliers and providers.
- [ ] Verify that excavation, subgrade, drainage, and base match project requirements.
- [ ] Check forms, blockouts, embeds, and elevations.
- [ ] Verify reinforcement against approved details and complete required inspections.
- [ ] Independently review net volume, practical order quantity, supply method, and order details.
- [ ] Clarify crew roles, communication, supervision, and stop-work authority.
- [ ] Stage, inspect, fuel or power, and back up tools and equipment as needed.
- [ ] Review the current forecast and measured-condition plan.
- [ ] Match the placement and finishing sequence to actual crew and equipment capacity.
- [ ] Stage compatible curing materials and protection.
- [ ] Assign applicable OSHA and employer controls; review product labels and SDSs; address wet-concrete skin and eye protection, task-specific dust and silica controls, utility locating, truck and equipment exclusion, lifting, impalement, electrical hazards, access, lighting, first aid, and cleanup.
- [ ] Confirm testing, inspection, and documentation responsibilities.
- [ ] Prepare washout, excess-material, waste, and environmental controls.
- [ ] Close every critical item or hold the pour.

Selected sources: NRMCA *CIP 31—Ordering Ready Mixed Concrete* and preconstruction resources; ACI PRC-305-20, PRC-306-16, and ACI PRC-308-26: Curing of Concrete—Guide; NRMCA CIPs 11, 12, and 27; FHWA-HIF-18-015 and FHWA-HIF-24-033 as pavement-specific supplements; FHWA-HIF-16-005 for bounded support context; OSHA concrete/masonry, silica, wet-cement, and excavation requirements/guidance; and ACI slab/joint/reinforcement education. Full citations and scope limits appear in Back Matter C.

CHAPTER 10

15 Concrete Planning Mistakes That Cost Time & Money

READER OUTCOME

Recognize common planning failures before they become costly field problems.

10.1 Measuring Only Once

One measurement can capture a reading error, the wrong edge, or an intended dimension rather than the built form. Recheck critical dimensions after base and forms are ready, and use a second person where the quantity or structural consequence is material.

10.2 Using the Wrong Units

A number without a unit is unfinished information. Keep inches, feet, square feet, cubic feet, cubic yards, pounds, tons, hours, and dollars visible through the calculation. Convert deliberately; never let spreadsheet formatting decide the unit.

10.3 Forgetting Thickness Conversion

Entering 4 inches as 4 feet makes the volume twelve times too large because $4\text{ ft} \div (4/12\text{ ft}) = 12$. Use the 324 shortcut or convert inches to feet explicitly.

10.4 Ignoring Irregular or Multiple Sections

An average rectangle can omit landings, curves, thickened areas, footings, or repeated pieces—and can count overlap twice. Sketch, divide, calculate each component, and add after units match.

10.5 Treating Theoretical Volume as the Final Order

Net geometry is a required checkpoint, not an automatic purchase quantity. Review actual forms, excavation, placement, project-specific variability, and supplier ordering terms while keeping every adjustment visible.

10.6 Using One Waste Percentage for Every Project

A favorite percentage cannot distinguish precise forms from irregular excavation or easy chute access from a difficult transfer. Measure what can be measured, correct what can be corrected, and document the remaining allowance decision.

10.7 Choosing Bags or Ready-Mix Based Only on Unit Price

Shelf price and per-yard price describe different systems. Compare whole-bag rounding or supplier order terms, delivery, handling, mixing, labor, equipment, access, continuity, cleanup, and risk. There is no universal break-even volume.

10.8 Forgetting Delivery or Short-Load Costs

Supplier terms may be per load, zone, mile, quantity band, yard, or hour. Confirm them in writing and extend each unit correctly. Do not import another supplier's fee into the estimate.

10.9 Ignoring Base and Reinforcement Materials

Concrete volume does not price the foundation or reinforcement system. Build the material takeoff from the project documents and site requirements. Never add a generic reinforcing scheme merely because the estimate seems incomplete.

10.10 Underestimating Labor

Clock duration is not labor-hours, employee wage is not loaded labor cost, and loaded cost is not customer price. Break work into tasks and use company productivity and cost records or transparent hypothetical inputs.

10.11 Forgetting Equipment and Access Requirements

A correct quantity is of little help if material cannot reach the forms. Walk the route, coordinate heavy-vehicle access, stage equipment, identify power/water needs, and obtain current local quotes.

10.12 Ignoring Weather

Weather affects people, materials, surface behavior, protection, delivery, and schedule. Check current conditions and prepare a project-specific response to heat, cold, wind, sun, or precipitation with appropriate technical input.

10.13 Failing to Plan Curing

Waiting until finishing is complete to look for curing material creates a preventable gap. Select the approved method, stage supplies and backups, assign responsibility, and plan monitoring before placement begins.

10.14 Forgetting Overhead or Other Indirect Costs

Recovering direct field cost is not the same as covering the business. Define project indirects and company overhead, allocate them consistently, and avoid both omission and double counting.

10.15 Treating an Estimate or Calculator Result as a Substitute for Project-Specific Professional Judgment

A calculator processes inputs. It does not see soil, loads, reinforcement, code adoption, access, weather, finish, safety, supplier terms, or the consequences of a wrong assumption. Use calculations to support decisions, not to replace design or professional responsibility.

Selected sources: This chapter synthesizes Chapters 2–9 using *UFS 3-740-05*, GAO-20-195G, NRMCA ordering/yield resources, FHWA support guidance, ACI weather/curing/joint education, BLS labor data, OSHA hazard guidance, and quote-based equipment planning. Full citations appear in Back Matter C. No frequency, savings, or loss statistic is claimed.

CHAPTER 11

The Complete Concrete Project Planning Workflow

> **READER OUTCOME**
> Follow one repeatable start-to-finish workflow for planning a concrete project.

Step 1 — Define the Project

Write the scope, intended use, limits, finish, interfaces, responsibilities, exclusions, and required approvals. Identify which dimensions and material requirements come from project documents or qualified design.

Output: controlled scope statement and open-issue list.

Step 2 — Identify the Project Shape and Sections

Sketch every rectangular, circular, linear, repeated, thickened, sloped, or irregular component. Assign section names that will follow through quantity, takeoff, and estimate.

Output: labeled geometry sketch.

Step 3 — Measure the Site

Measure the actual forms, excavation, or verified project geometry. Record raw values and units, repeated-item counts, changes in depth, and measurement limitations.

Output: dated field measurement sheet.

Step 4 — Verify Dimensions and Units

Compare field information with current drawings and intended scope. Check diameter versus radius, inches versus feet, area versus volume, and duplicated or missing sections.

Output: independently checked inputs.

Step 5 — Calculate Theoretical Concrete Volume

Calculate every section in compatible units, total cubic feet, and convert to cubic yards or product-specific bag volume. Keep full precision until the reporting step.

Output: net theoretical volume. See the independently checked examples in Chapter 3.

Step 6 — Account for Project-Specific Waste and Variability

Measure or correct variable conditions where possible. Document remaining excavation/form variation, placement exposure, or other uncertainty separately. Do not insert an unexplained universal percentage.

Output: documented additions/allowance decision.

Step 7 — Determine the Practical Order Quantity

Combine net volume and documented project additions, then confirm supplier increments, minimums, load policy, and rounding. Record the practical quantity separately.

Output: supplier-confirmed order basis.

Step 8 — Choose Ready-Mix or Bagged Concrete

Compare the full quantity, delivery, handling, mixing, labor, equipment, access, continuity, cleanup, cost, and risk plans. Use exact product yields and actual supplier terms.

Output: selected supply plan and an alternate or contingency where appropriate.

Step 9 — Build the Material Takeoff

Add base, reinforcement from approved design, forms, joints, vapor-control materials where specified, curing/protection, embeds, and other project materials. Trace each line to its source.

Output: material takeoff with units and open issues.

Step 10 — Plan Labor

Break work into tasks, people, and labor-hours. Use company productivity and loaded cost for an actual estimate; keep wages, employer cost, contractor cost, and customer price distinct.

Output: crew/task plan and labor estimate.

Step 11 — Plan Equipment and Access

Walk the material route. Select equipment based on the actual supply and placement method, check availability/instructions, and obtain current local quotes.

Output: access drawing, equipment list, and quote record.

Step 12 — Build the Cost Estimate

Extend each verified quantity by a dated quote or documented company input. Include applicable direct materials, delivery, labor, equipment, site work, finishing, curing, testing, permits, cleanup, and other project costs.

Output: itemized estimate with assumptions and date/location context.

Step 13 — Add Appropriate Indirect Costs, Overhead, and Pricing Considerations

Apply the company's accounting and pricing policy. Define the cost base, eliminate double counting, and distinguish markup from margin and estimated from realized profit.

Output: reviewed cost base and authorized selling price, if applicable.

Step 14 — Review Weather, Delivery, and Schedule

Use current forecast and measured conditions, producer/project constraints, inspection readiness, crew/equipment capacity, and the curing/protection plan. Schedule from dependencies, not generic promises.

Output: current coordinated schedule and go/no-go criteria.

Step 15 — Complete the Pre-Pour Review

Confirm scope, site, base, forms, reinforcement, embeds, order, people, equipment, weather response, placement/finish, curing, cleanup, safety, and documentation. Close critical issues or hold the pour.

Output: signed/recorded pre-pour release appropriate to the project.

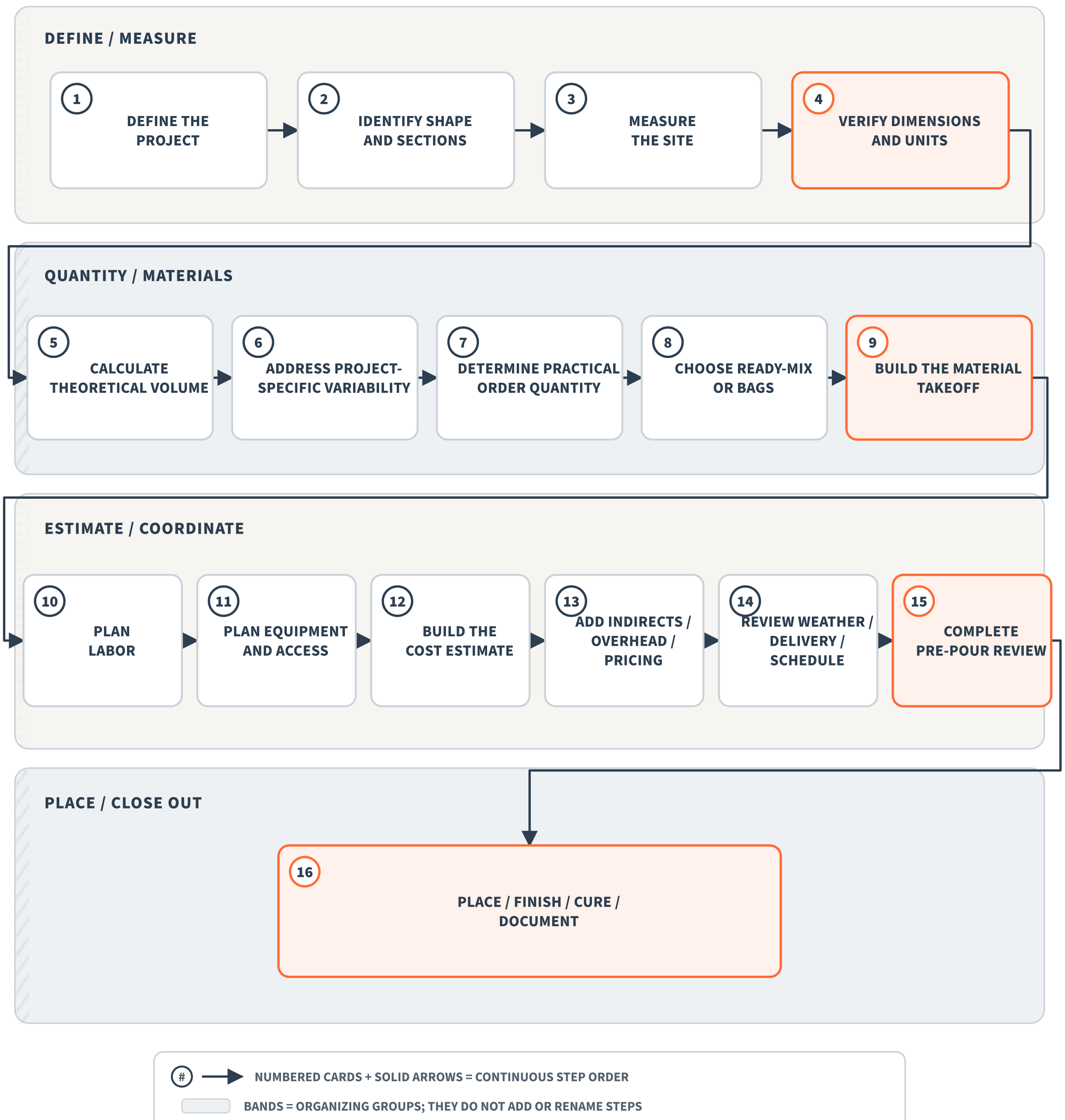
Step 16 — Place, Finish, Cure, and Document the Project

Responsible, qualified parties carry out the approved means, methods, safety controls, testing, placement, finishing, curing, protection, and closeout. Record deliveries, changes, conditions, inspections, and exceptions for future learning.

Output: completed work records and lessons for the next estimate.

THE COMPLETE PROJECT PLANNING WORKFLOW

EDUCATIONAL PROJECT WORKFLOW — NOT A FEDERAL PROCEDURE



The 16-step workflow carries one controlled project scope from definition and measurement through quantity, estimating, coordination, placement, curing, and closeout.

Selected sources: *UFS 3-740-05* and GAO-20-195G for estimating discipline; NRMCA ordering and preconstruction topics; OSHA concrete, wet-cement, silica, and excavation sources; ACI weather/curing guides; the named bag-product documents; and the named supplier examples. Full citations appear in Back Matter C. This workflow is an educational project sequence, not a federal procedure or a substitute for project-specific means, methods, and safety planning.

CHAPTER 12

Final Concrete Project Checklists

READER OUTCOME

Use printable/reference-friendly checklists during actual project planning.

Use these planning prompts with current project documents, jurisdiction requirements, the employer safety program where applicable, producer/manufacturer instructions, and qualified decisions.

12.1 Project Definition Checklist

- ☐ Identify the project owner, address, contacts, and decision authority.
- ☐ Write the intended use and limits of the concrete work.
- ☐ Identify the latest drawings, specifications, and revisions.
- ☐ Identify the finish, elevations, drainage, interfaces, and tolerances.
- ☐ Assign structural and design responsibilities.
- ☐ Assign permit, inspection, utility, and jurisdiction questions.
- ☐ Write the inclusions, exclusions, alternates, and owner-provided items.
- ☐ Record site-access and working-hour constraints.
- ☐ Give every open issue an owner and due date.

12.2 Site Measurement Checklist

- ☐ Show every project section on a labeled sketch.
- ☐ Record units with each raw length, width, height, thickness or depth, diameter or radius, and count.
- ☐ Trace required dimensions to field conditions or project documents.
- ☐ Measure forms and excavation after the relevant preparation.
- ☐ Address slopes, low spots, thickened areas, openings, returns, and repeated items.
- ☐ Divide irregular areas into traceable shapes.
- ☐ Check for overlaps and omissions.
- ☐ Independently remeasure critical dimensions.
- ☐ Retain the measurement date, person, and revision.

12.3 Concrete Quantity Checklist

- [ ] Show each inches-to-feet conversion or use the 324 shortcut correctly.
- [ ] Distinguish square units from cubic units.
- [ ] Match rectangle, circle, wall, footing, and repeated-item formulas to the shape.
- [ ] Divide diameter by two before using radius.
- [ ] Calculate each section before totaling the sections.
- [ ] Carry full precision until the final display.
- [ ] Divide cubic feet by 27 to obtain cubic yards.
- [ ] Label net volume clearly.
- [ ] Confirm the critical result with a second arithmetic method or reviewer.
- [ ] Retain calculation worksheets for traceability.

12.4 Waste and Order-Quantity Checklist

- [ ] Preserve net volume as a separate value.
- [ ] Recheck the base, excavation, and forms before deciding on an allowance.
- [ ] Add measurable variation as a measured quantity.
- [ ] Document remaining uncertainty and the reasoning used.
- [ ] Do not treat a universal waste factor as a requirement.
- [ ] Confirm supplier increments, minimums, load terms, and rounding.
- [ ] Discuss the shortage response and excess-material plan.
- [ ] Approve and record practical order quantity separately.

12.5 Materials Checklist

- [ ] Confirm the concrete mixture or product and supply method.
- [ ] Confirm base or subbase material and preparation requirements.
- [ ] Take reinforcement and accessories from approved details.
- [ ] Plan forms, ties, bracing, fasteners, blockouts, and release material.
- [ ] Trace joint types, layout, and materials to project requirements.
- [ ] Include the vapor-control system where specified.
- [ ] Select a compatible curing and protection system.
- [ ] Review embeds, anchors, sleeves, insulation, drainage, and miscellaneous items.
- [ ] Include cleanup, washout, environmental, and temporary-protection materials.
- [ ] Confirm that quantities, purchase units, availability, lead times, and quotes are current.

12.6 Ready-Mix Ordering Checklist

- [ ] Confirm the producer and plant or service contact.
- [ ] Confirm the project address, delivery point, site contact, and communication method.
- [ ] Confirm quantity, units, mixture or project requirements, and permitted add-ons.
- [ ] Coordinate the delivery date and sequence with crew, equipment, testing, and inspection.
- [ ] Check the truck or pump route, staging, overhead clearance, grade, surface, and underground constraints.
- [ ] Confirm delivery zone, mileage, minimum, short-load, load-capacity, standby, and cancellation terms.
- [ ] Confirm included unloading time and change procedures.
- [ ] Confirm washout, excess, rejected or returned-material, and cleanup policies.
- [ ] Read back and retain the written quote or order.

12.7 Bagged Concrete Checklist

- [ ] Confirm the exact product, bag size, lot availability, and current instructions.
- [ ] Take approximate yield from the current package or manufacturer source.
- [ ] Divide project volume by product yield.
- [ ] Round the raw result up to whole bags.
- [ ] Document any additional project quantity separately.
- [ ] Provide dry, secure storage close enough for safe handling.
- [ ] Plan the water source and measurement, mixer or method, power, and backups.
- [ ] Confirm that the crew can maintain the intended batching, placement, and finishing sequence.
- [ ] Review the product label and safety data sheet; stage task-appropriate skin, eye, and clothing protection.
- [ ] Control dry-product dust through the task plan; do not treat a generic dust mask as the complete silica plan.
- [ ] Plan bag lifting and handling, guarded mixing equipment, wet-location electrical controls, cleanup, and disposal.

12.8 Cost-Estimating Checklist

- [ ] State the estimate scope, location, date, revision, inclusions, and exclusions.
- [ ] Trace every cost line to a quantity and unit.
- [ ] Record supplier or product name, geography, date, and terms with each price.
- [ ] Address concrete, other materials, delivery, labor, equipment, site work, finishing, curing, and cleanup.
- [ ] Review tax, permit, testing, pumping, standby, mobilization, and other applicable lines.
- [ ] Keep quote-required lines visible instead of inserting invented averages.
- [ ] Document risk items and estimate responses.
- [ ] Independently check arithmetic, units, and subtotals.
- [ ] Schedule the quote-validity check and estimate-update date.

12.9 Contractor Pricing Checklist

- [ ] Define direct, project-indirect, and business-overhead categories.
- [ ] Use company loaded rates and actual labor-hours for labor cost.
- [ ] Keep customer billing or selling price distinct from wage and loaded cost.
- [ ] Follow company policy for equipment rental or ownership cost.
- [ ] Remove duplicate recovery among unit costs, burdens, indirects, overhead, and markup.
- [ ] State the cost base used for markup or margin.
- [ ] Check markup and margin denominators.
- [ ] Treat target percentages as company decisions, not industry standards.
- [ ] Review payment, schedule, warranty, tax, exclusions, and changes.
- [ ] Obtain authorized approval for the selling price.

12.10 Labor and Equipment Checklist

- [ ] Break the work into setup, supply, placement, finishing, curing, cleanup, and documentation tasks.
- [ ] Calculate labor-hours as people multiplied by hours per person.
- [ ] Match crew roles and handoffs to the planned material flow.
- [ ] Assign required skills, supervision, and safety responsibilities.
- [ ] Walk the access and movement route.
- [ ] Confirm equipment capacity and suitability from project needs and instructions.
- [ ] Document a current rental quote or ownership-cost method.
- [ ] Address delivery, fuel or power, consumables, cleaning, extension time, and backups.
- [ ] Address guards, cords, hoses or lines, shutdown controls, and wet-location electrical provisions.
- [ ] Inspect equipment and tools before the pour; remove damaged or unsuitable items from service.

12.11 Pre-Pour Checklist

- [ ] Complete scope, design, permit, and inspection prerequisites.
- [ ] Complete the applicable utility-location or one-call process and required markings and clearances before excavation.
- [ ] Obtain required acceptance of the site, subgrade, base, forms, reinforcement, and embeds.
- [ ] Independently review the quantity and order or product plan.
- [ ] Prepare access, staging, crew, equipment, communication, and lighting.
- [ ] Review the current weather and protection plan.
- [ ] Confirm the placement and finishing sequence and interruption response.
- [ ] Prepare curing materials, the application plan, monitoring, and backups.
- [ ] Prepare the wet-concrete skin and eye response, task-specific dust and silica plan, truck and equipment exclusion areas, lifting and impalement controls, electrical protections, first aid, washout, cleanup, and environmental controls.
- [ ] Close critical open issues; have the responsible person issue the go or no-go decision.

12.12 Placement and Finishing Checklist

- [ ] Check delivery or product identification against the order and project.
- [ ] Assign one responsible person to control communication and changes.
- [ ] Keep the material route and placement sequence clear.
- [ ] Monitor forms, supports, reinforcement, and embeds for movement.
- [ ] Follow approved handling, placement, consolidation, and finishing methods.
- [ ] Keep people outside truck and equipment blind spots and exclusion areas; assign one person to coordinate movement and changes.
- [ ] Keep wet concrete off skin and out of eyes; handle contaminated clothing and exposure under the product safety directions.
- [ ] Make no unauthorized water, product, or mixture change.
- [ ] Coordinate required testing and inspection.
- [ ] Monitor weather and site conditions; activate the response plan as needed.
- [ ] Check finish, edges, joints, elevations, drainage, and protection.
- [ ] Document exceptions and decisions.

12.13 Curing Checklist

- [ ] Identify the approved curing and protection method and the responsible person.
- [ ] Stage sufficient, compatible materials and backups.
- [ ] Begin curing under the approved method and the actual surface and condition decision.
- [ ] Address the full surface, edges, corners, penetrations, and vulnerable areas.
- [ ] Adjust temperature and moisture protection to current conditions.
- [ ] Maintain continuous coverings or application and repair damage.
- [ ] Control heater, enclosure, ventilation, electrical, fire, and combustion-gas hazards where applicable.
- [ ] Record inspections, conditions, products, repairs, and interruptions.
- [ ] Base duration and removal or change decisions on project requirements and qualified input.
- [ ] Treat opening, loading, coating, form removal, and acceptance as separate project decisions.

12.14 Final Project Review Checklist

- [ ] Compare the work with the scope and current project documents.
- [ ] Retain delivery tickets, product records, tests, inspections, photos, and changes.
- [ ] Record final quantities and actual costs without overwriting the estimate.
- [ ] Communicate remaining protection, access, curing, loading, and closeout requirements.
- [ ] Complete cleanup, washout, disposal, restoration, and owner responsibilities.
- [ ] Handle invoices, change documentation, warranties, and acceptance under project terms.
- [ ] Review estimate-to-actual differences to improve future productivity and pricing.
- [ ] Capture safety, quality, supplier, schedule, and planning lessons.

Selected sources: These checklists synthesize Chapters 1–11 using *UFS 3-740-05*, GAO-20-195G, NRMCA ordering/preconstruction resources, the named bag-product documents, OSHA concrete/wet-cement/silica/excavation sources, ACI weather/curing guides, FHWA pavement-specific curing/support publications, and project-control principles. Full citations appear in Back Matter C. The checklist language and organization are independent and do not reproduce a source checklist.

BACK MATTER A

Useful ConcreteCalculate Calculators & Resources

No ConcreteCalculate calculator is endorsed in this edition. The only approved quantity resource is an informational guide:

- How to Calculate Concrete: Volume, Cubic Yards, and Bags — an informational walkthrough for measurement and quantity arithmetic.

Use it after recording your own dimensions and units. Compare its method with the formulas and independent-check process in Chapter 3, resolve differences before ordering, and retain the calculation worksheet. The linked page is not project design, code verification, supplier policy, or a price source.

The approved guide contains outbound links to other ConcreteCalculate tools. Those outbound pages are not approved by this ebook. Other technical and cost calculators were deliberately excluded from this edition after page-specific review; a page's presence on the same website does not make it an endorsed source.

BACK MATTER B

Quick Reference Tables

Core unit conversions

Conversion	Verified relationship
Inches to feet	inches ÷ 12
Feet to inches	feet × 12
Feet to yards	feet ÷ 3
Cubic feet to cubic yards	$ft^3 \div 27$
Cubic yards to cubic feet	$yd^3 \times 27$

Geometry formulas

Shape	Volume formula	Unit control
Rectangular slab/footing	L × W × D	All dimensions in same unit
Wall	L × H × T	All dimensions in same unit
Cylinder/circular pad	$\pi \times r^2 \times H$	Radius is half diameter
Repeated elements	one-element volume × count	Calculate one correctly before multiplying
Multiple sections	A + B + C + …	Add only after units match
Slab shortcut	L(ft) × W(ft) × T(in) ÷ 324	Produces yd^3

Thickness conversion

Inches	Feet
2	0.1667
3	0.2500
4	0.3333
5	0.4167
6	0.5000
8	0.6667
10	0.8333
12	1.0000

Quantity-control sequence

Keep separate	Meaning
Net volume	Perfect geometry from verified measurements
Measured additions	Quantified field variation
Project allowance	Explicit response to remaining identified uncertainty
Purchase/order rounding	Whole bags or actual supplier increment/minimum
Practical quantity	Final documented supply decision

Estimating layers

Layer	Examples	Control
Quantity	yd^3, bags, tons, pieces, labor-hours	Measurement/takeoff
Unit cost	Supplier quote, product price, loaded labor, rental quote	Source/date/geography/company
Direct cost	Concrete, project labor, equipment, forms, site work	Project scope
Indirect/overhead	Project support and business cost	Company accounting policy
Price/profit	Markup or margin method	Company commercial decision

All tables above are original. They contain stable arithmetic only and no structural-design values.

References and Sources

The entries below identify the external sources used for technical concepts, public standard identities, government data, named products, local supplier examples, and safety boundaries. The two approved ConcreteCalculate links remain in their authorized placements: Section 3.15 and Back Matter A for the informational guide, and Back Matter E for the product page. Web sources were accessed or rechecked on **2026-08-29** unless another publication or effective date is stated. A publication identifier is supplied where no durable direct public document URL was established.

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BACK MATTER D

About ConcreteCalculate

ConcreteCalculate.com provides practical calculators, guides, charts, and planning resources designed to help homeowners, DIYers, contractors, and estimators work through common concrete and construction calculations. Our goal is to make project quantities, material planning, and estimating concepts easier to understand and use.

Only two ConcreteCalculate destinations are included in this edition: the audited informational quantity guide in Back Matter A and the optional product page in Back Matter E. Their inclusion does not approve other tools on the site.

BACK MATTER E

Optional Next Step — Concrete Contractor Estimator Pack

If you prefer to organize project quantities and estimate inputs in a reusable workbook, view the Concrete Contractor Estimator Pack and current price at ConcreteCalculate.com.

The product page describes a one-time digital download with no subscription: one Excel workbook with nine connected sheets covering project setup, concrete quantity, materials, cost estimating, estimate output, dashboard, references, and help, plus supporting PDF materials.

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