

LARE 2023 Blueprint Review

Construction Documentation & Administration

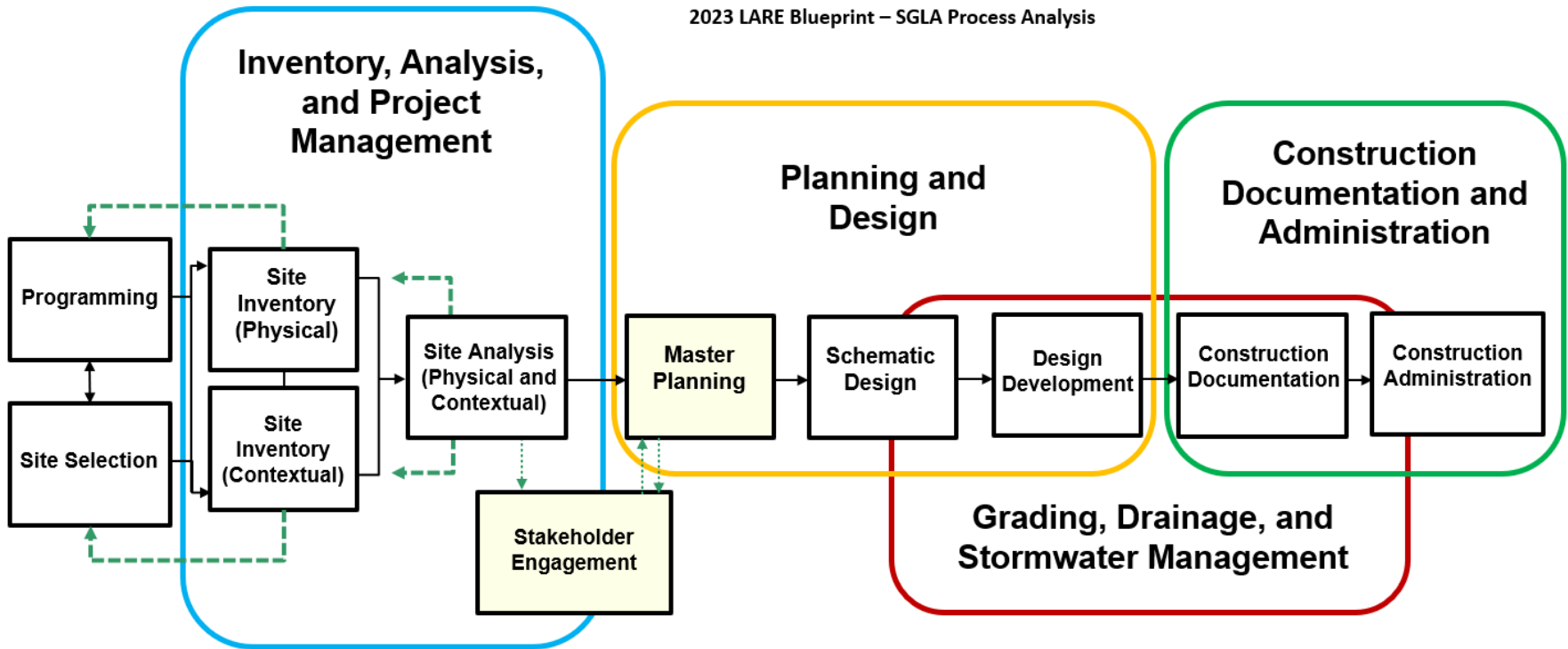


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2023 Blueprint

2023 LARE Blueprint – SGLA Process Analysis



Construction Documentation & Administration topics

Construction Documentation & Administration – Updated 9.2023

90 scored items & 10 [pretest](#) items consisting of [multiple-choice](#), [multiple-response](#) and advanced [item type](#) questions; 3 ½ hours seat time, 3 hours for exam



Construction Plans and Details: 50%	Construction Specifications and Bidding: 20%	Construction Administration: 30%
<ul style="list-style-type: none">• Identify Required Plan Sheets• Produce Existing Conditions and Demolition Plan• Produce Protection and Mitigation Plan• Produce Layout and Materials Plan (e.g., site furnishings)• Produce Planting Plans and Details• Create Details, Elevations, and Sections (e.g., walls, pavements, structures, specialty features, green roofs, drainage details)• Collaborate on Supplemental Plans (e.g., lighting, irrigation, playground, wayfinding)• Develop General Notes, Schedules, and Legends• Comply with Code Requirements and Dimensional Standards• Perform QA/QC Activities	<ul style="list-style-type: none">• Develop Project Manual and Front-End Specifications• Establish Bid Requirements• Write Technical Specifications• Facilitate Bid Process (e.g., bid forms, meetings, delivery process)• Respond to Bidders' Questions and Prepare Addenda	<ul style="list-style-type: none">• Conduct Pre-Construction Activities (e.g., walk-through, meetings)• Respond to RFIs• Manage Construction Contract (e.g., budget items, change orders, bulletins, purchase requests, change directives)• Review Submittals (e.g., shop drawings, materials submittal, product submittals, substitutions, mock-ups)• Conduct Site Observations and Field Reports• Perform Project Close-Out (e.g., punch-list, substantial completion, guarantee period, final completion)• Perform Construction Project Management (e.g., roles and responsibilities, liabilities, scope, schedule, coordination with other disciplines, coordination with owner)

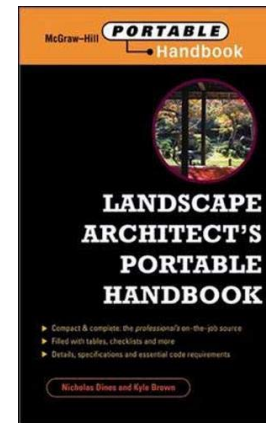
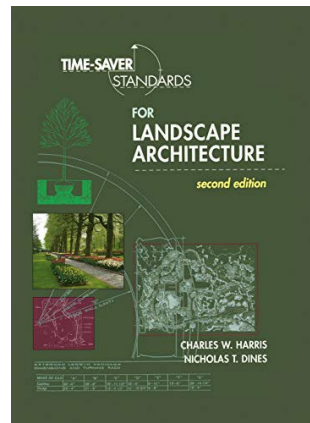
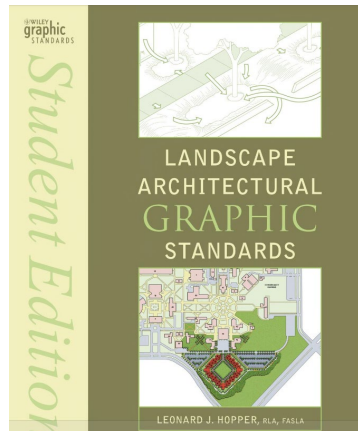
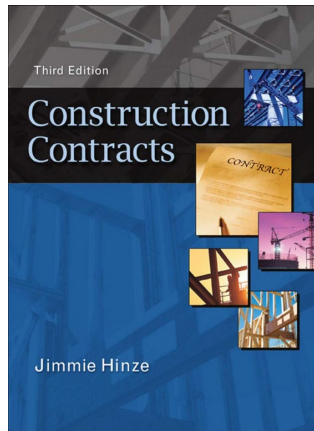
CLARB's Recommended Reading

Construction Documentation & Administration



- **Construction Contracts**, 3rd edition / Hinze
- **Landscape Architectural Graphic Standards - Student Version** / Hopper
- **Time-Saver Standards for Landscape Architects**, 2nd Edition / Harris and Dines
- **Landscape Architecture Documentation Standards** / Design Workshop
- **Landscape Architects Portable Handbook** / Dines and Brown

The reference material list has been prepared by the CLARB Examination Committee. While the Committee believes that mastery of the topics dealt with in the volumes on this list will be of assistance to you in preparing for the L.A.R.E., no representation is made that mastery of the topics dealt with by these volumes will ensure a passing grade on the examination, and no representation is made that the examination questions will be limited in scope to topics dealt with by the volumes contained on this list. Candidates are not expected to review all of the books on this list, as subject areas may be covered by several references. CLARB in no way guarantees that the contents of these references are accurate. Last modified August 23, 2023.



Other recommended resources

CLARB's Practice Exams. Released in October 2023, 50 questions for each section of the LARE. \$25/ea, you will have access for three attempts within a year. (No access for test prep folks, alas)

I recommend you try them about halfway through your study.

LAREprep and **Pass the LARE** are private companies that offers online practice tests that are similar in format to the 2023 testing format. They cost between \$22-28 per test.

LARE Google Group Public discussion group /community of LARE candidates.
<http://groups.google.com/group/lare-exam?lnk=>

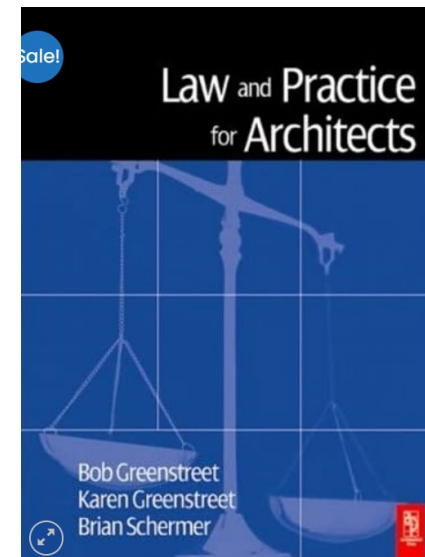
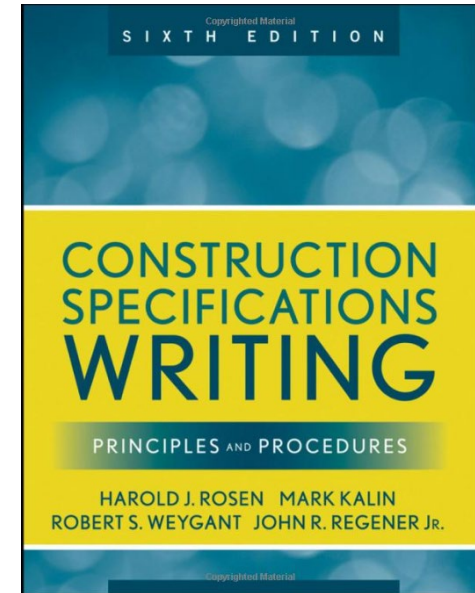
- Online flashcard apps like **Quizlet** and **Anki**. Fun and extremely useful for building vocabulary, especially for ESL folks.
- Your classmates in this course. If you do not want your contact info shared, let me know ASAP.

Other books that might help you.

Construction Specifications Writing: Principles and Procedures, Kalin/Weygant/Rosen/Regener. If you don't write specifications, this is a great resource, with samples in an appendix.

Law and Practice for Architects, Greenstreet/Greenstreet/ Schermer. Covers the same material found in Construction Contracts/Hinze but much easier to read for some people. (Also a good resource for Inventory, Analysis and Project Management.)

So many books! Use libraries if you can. Buy second-hand copies if you can. Once you have passed the LARE, sell your books in the LARE Google Group to the next crop of candidates.



Explicit vs Implicit Requirements

Explicit Requirements are given in the question. Answering them is relatively straightforward.

- Do a careful reading of each question and the available answers.
- You are expected to select the most appropriate answer from those available.
- Note that you may not believe there is a “right” answer. Look for clues in the question to narrow down the options.

Implicit Requirements are things you would normally be expected to do during the practice of Landscape Architecture. There are four to know:

- Protecting the Health Safety and Welfare of the Public (HSW)
- Complying with Regulations & Codes
- Minimizing Adverse Environmental Impacts
- Developing Sites and Using Materials Efficiently in your Designs

Do not add other considerations to LARE questions! Take questions at face value and keep it simple. You may need to *forget some of what you know*.

Study and Exam Preparation

Work on these skills for passing the LARE:

1. Fluency and experience within each subject area of the exam.
 - CLARB's reference books. Know the graphics and vocabulary well.
 - Some topics are not covered by books. Look for real world examples.
2. Developing and maintaining a positive attitude towards test-taking in general and developing the ability to deal effectively with test-taking stress
3. Developing the ability to keep written instructions and information in context, treating each problem statement as a complete task.

Your subject area preparation should focus on

- Subjects covered by exam specs. Which do you know well? Which are new to you?
- General principles and theories
- Terminology
- Applied knowledge - problem solving

Refining the LARE's format

CLARB continues to tweak the exam format so it is mostly the same whether you are at a test center or at home. This creates a fairer exam.

In all cases, you are allowed to take a break if you need it, but it will cost you. You will not be able to go back and revisit questions after the break, and the clock keeps running during the break

****(Try to avoid taking a break)****

AT HOME: You will need to use the digital whiteboard and calculator. Practice!

AT TESTING CENTERS: You will be given a handheld whiteboard and calculator on request, as of January 2024. yay!!

CLARB's new Demo Exam allows you to practice how these work.

<https://portal-v5.examstudio.com/PLExam.aspx>

Anxiety

Many LARE candidates struggle with anxiety. Here are some ideas – we welcome your tips as well.

- **Find low-stakes versions of the situation you are dreading and get comfortable in them.** Take your laptop to a public library, and work practice problems on the computer screen, with its built-in calculator and a paper notepad.
- Before the exam, find ways to **regularly visualize** yourself being in the exam but being calm and feeling well-prepared.
- Anxiety is a form of hyperattention. Not all attention is experienced as being bad. Experiment with **shifting from anxiety to curiosity**, which is also a form of attention but has much less painful side effects.
- **Radical acceptance.** Buddhist teacher Tara Brach has great lectures on this tool It sometimes helps defuse the charge on the outcome.
- If you feel your anxiety rising, try not to judge yourself. Think of it as an opportunity to practice recentering. See if you can find a way to calm yourself - breathing, visualization, counting backwards, or imagining your happy place.

Typical design process/milestones

Most firms structure work using a fairly typical design sequence that advances the project, the budget, and the decision-making process in an efficient, orderly way.

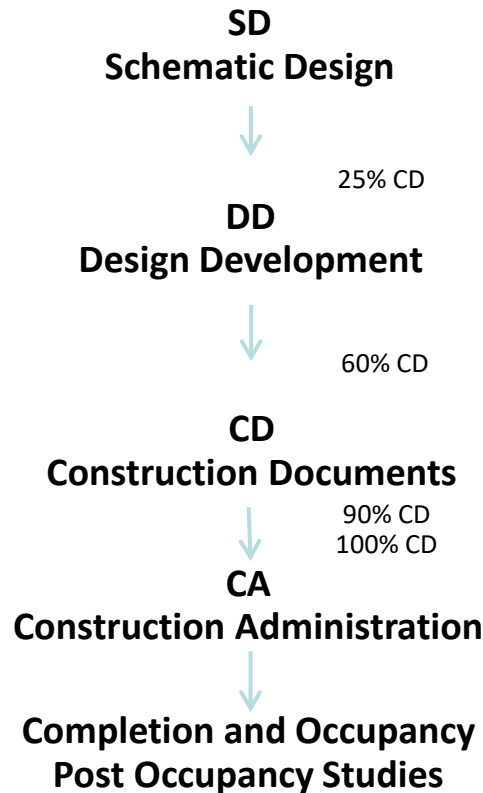
This graphic represents the working terms used by many firms.

Below is a related list from Ramroth listing typical percentage-complete milestones:

Drawings:

- 0%** The drawing is not started.
- 25%** The drawing has been started – plans, sections, elevations, or details are still in progress
- 50%** Plans, sections, elevations, or details are drawn but not dimensioned, or dimensions are missing. There are no notes or material call-outs or notes/callouts are incomplete or missing.
- 90%** The drawing is complete but has not been submitted for a quality-control (QC) check.
- 100%** The drawing has been checked for quality control and the QC comments have been corrected on the drawing.

[Ramroth](#), *Project Management for Design Professionals*



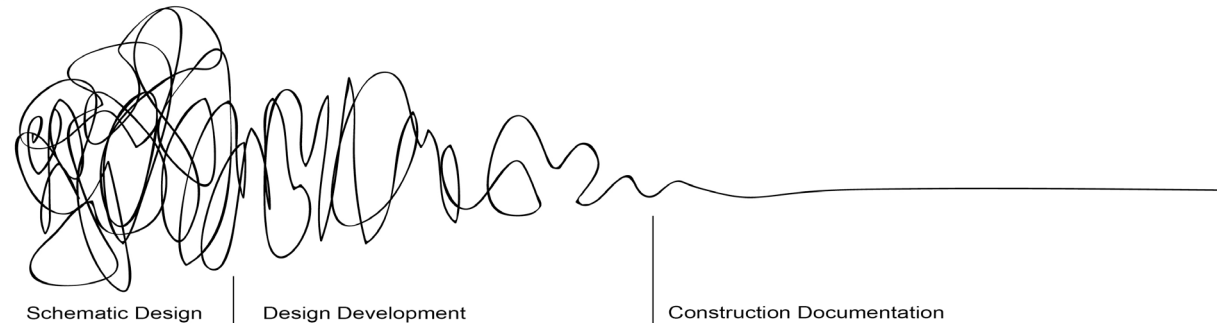
- Explore **design alternatives** as bubble diagrams
- Resist the urge to dive into details
- Loose graphics, napkin sketches
- **Final product – Approved Schematic Design Concept, very preliminary cost estimate**

- Explore different **materials, finishes** with client
- Evaluate for appearance, durability, cost
- **Final product – Approved DD Level plan layouts, draft construction details for costing, more solid cost estimate**

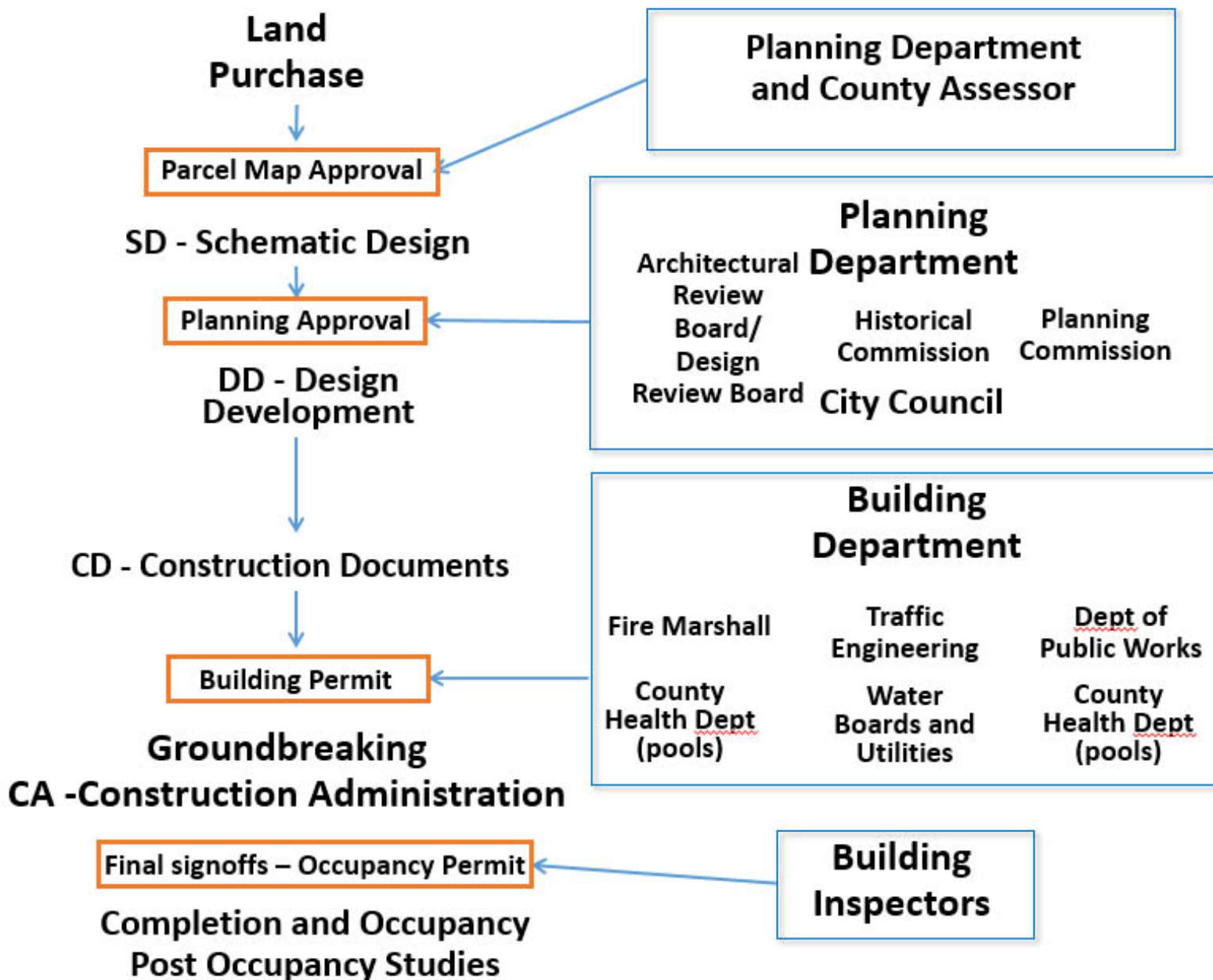
- At beginning of CD phase, all layout and materials decisions should have been made. This phase is about **hardlining the CDs**.
- Exchange milestone sets for coordination and permit review (90% - QAQC - 100%)
- **Final products – Permit Set and Bid Set Plans, Specifications, Final Cost Estimate (PS&E)**

Uncertainty / patterns / insights

Clarity / Focus



Typical design process + agency review



Materials List – Updated 09.2023

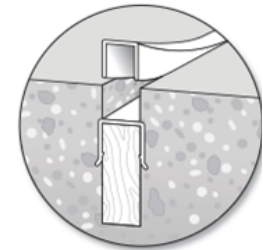
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Angle Iron	Joint Sealing Compound
Asphalt (Bituminous Concrete)	Mastic
Brass Pipe	Metal Sleeve
Brick	Mortar
Butt Hinge	Mulch
Caulk	Perforated PVC Pipe
Ceramic Tile	Polyethylene Pipe
Concrete	Porcelain Enamel
Concrete Masonry Units (CMU)	Portland Cement
Concrete Pavers	Prefabricated Wall Drain
Copper Pipe	PVC Pipe
Epoxy Sealer	Sand
Expansion Joint Material	Soil
Filter Fabric	Soil Cement
Flagstone	Steel Tubing - Round
Flashing	Steel Tubing - Square
Flat Steel	Steel Washers
Floor Drain	Stone
Foam Insulation	Stone Dust (Fines)
Galvanized Electrical Conduit	Strap Hinge
Gate Latch Assembly	Stucco
Geotextile grid	Tar
Granite	Wall Reinforcement
Gravel (crushed stone, granular material, aggregate, pea gravel)	Waterproofing (Bituminous)
Grout (non-shrink)	Waterstop
	Wood (Lumber)
	Wrought Iron

CLARB Materials List



Backer rod with fresh mastic seal on top



Zip strip – void filler with removable top.

The smooth horizontal face below [serves](#) as the bond breaker for mastic, to [be](#) applied after the top is pulled out.

Fasteners and Reinforcing List – Updated 09.2023

The following is a list of fasteners and reinforcing materials that may appear in questions on the L.A.R.E. This list has been prepared by the CLARB Examination Committee. While the Committee believes this list will be of assistance to you in preparing for the L.A.R.E., no representation is made that a complete understanding of the materials on this list will ensure a passing grade on the examination, and no representation is made that the examination questions will be limited in scope to the list shown.

BOLTS:

Carriage Bolt Assembly
Eye Bolt
J-Bolt Assembly
L-shaped Anchor Bolt Assembly
Lag Bolt
Lag Bolt with Expansion Shield
Lag Bolt with Fiber Plug
Lag Bolt with Lead Shield
Machine Bolt Assembly
Machine Bolt with Expansion Shield
Threaded Rod Assembly
Toggle Bolt Assembly

SCREWS AND NAILS:

Cement Nail
Common Nail
Finish Nail
Hook Nail
Machine Screw
Masonry Nail
Spike
Wood Screw

METAL BRACKETS:

Joist Hanger
Post Anchor
Post Cap Tie Plate
Strap Hanger
Plate Anchor

MISCELLANEOUS FASTENERS:

Construction Adhesive
Drive Anchor
Duct Tape
Epoxy
Masonry Wall Tie
Mastic
Mortar
Rivet
Snap Tie
Solder
Staple
Z-anchor

REINFORCEMENT:

#3 Rebar
#4 Rebar
#6 Rebar
#8 Rebar
Cavity Wall Tie
Fiber Mesh
Geosynthetic Reinforcing Grid
Steel Dowel
Truss Design Reinforcement
Welded Wire Mesh (WWM)

CLARB Fastener Lists

Wood Member Sizing Chart – Updated 09.2023

The following are charts that may appear in questions on the L.A.R.E. This material will be embedded within any question that requires use of the chart.

For external wood structures with uniform joist and beam spacing.

Maximum Allowable Spans for Spaced Boards

	Laid Flat			
	1 x 4 [25 x 100]	5/4 x 6 [30 x 150]	2 x 4 [50 x 100]	2 x 6 [50 x 150]
For Decking	12" [30cm]	16" [40cm]	24" [60cm]	24" [60cm]
For Benches	NA	NA	36" [100cm]	36" [100cm]

Maximum Allowable Spans for Joists

Joist Size	Joist Spacing		
	16" [40cm]	24" [60cm]	32" [80cm]
2 x 6 [50 x 150]	10' [3.0m]	8' [2.4m]	6' [1.8m]
2 x 8 [50 x 200]	12' [3.6m]	10' [3.0m]	8' [2.4m]
2 x 10 [50 x 250]	16' [4.8m]	14' [4.2m]	10' [3.0m]

Minimum Beam Sizes and Allowable Beam Spans

Spacing Between Beams	4' [1.2m]	6' [1.8m]	8' [2.4m]	10'[3.0m]	12'[3.6m]	
	—	—	—	—	—	Beam Size*
	6' [1.8m]	6' [1.8m]	—	—	—	4 x 6 [100 x 150]
	10' [3.0m]	8' [2.4m]	6' [1.8m]	6' [1.8m]	—	4 x 8 [100 x 200]
	12' [3.6m]	10' [3.0m]	8' [2.4m]	8' [2.4m]	6' [1.8m]	4 x 10 [100 x 250]
	12' [3.6m]	12' [3.6m]	10' [3.0m]	10' [3.0m]	8' [2.4m]	4 x 12 [100 x 300]
Maximum Distance Between Posts (o.c.)						

* - Two (2) 2 by's [50's] are acceptable.

NOTE: Maximum cantilever for joists and beams is 24" [60cm].

CLARB Wood Member Sizing Chart

Subdomain 1: Construction Plans and Details (50%)

- Identify Required Plan Sheets
- Produce Existing Conditions and Demolition Plan
- Produce Protection and Mitigation Plan
- Produce Layout and Materials Plan (e.g., site furnishings)
- Produce Planting Plans and Details
- Create Details, Elevations, and Sections (e.g., walls, pavements, structures, specialty features, green roofs, drainage details)
- Collaborate on Supplemental Plans (e.g., lighting, irrigation, playground, wayfinding)
- Develop General Notes, Schedules, and Legends
- Comply with Code Requirements and Dimensional Standards
- Perform QA/QC Activities

1.1 Identify Required Plan Sheets

Describe clearly the work to be done in order to achieve the desired end product.

- Plans, details, notes, specifications are all used to describe the work.
- Minimize duplication of information between plans, details, notes and specifications. Failure to do so may result in contradictory instructions to the Contractor.
- Specifications generally take precedence over drawings in the case of conflicts between the two.

SHEET INDEX	
COMBINED	
0.00 COVER SITE PLAN & SHEET INDEX	C600 ALTERNATE BID TRAIL LAYOUT AND GRADING PLAN
0.01 ACCESSIBLE PATH OF TRAVEL	
0.02 OVERALL PLAN FOR BID ALTERNATES	ELECTRICAL
0.02.01 LANDSCAPE PLANS FOR BID ALTERNATES	E1.1 ELECTRICAL LEGEND & DETAILS
0.03 SITE DEMOLITION PLAN	E1.2 ELECTRICAL DETAILS
0.04 BAY FRIENDLY SITE ANALYSIS PLAN	E2.1 ELECTRICAL PLAN & DETAILS
LANDSCAPE	
L1.01 MATERIAL PLAN	ROMTEC: SHTS. 57-98, SEE INDEX SHT. 57
L1.02 MATERIAL PLAN	GO COVER SHEET/REVISION & SHEET SCHEDULE
L1.03 MATERIAL PLAN	G1 GENERAL NOTES / SYMBOL LEGEND
L1.04 MATERIAL PLAN	G2 DESIGN CRITERIA AND CODE SUMMARY
L1.05 MATERIAL PLAN	A1.1 FLOOR PLAN
L2.03 LAYOUT PLAN	A2.1 ELEVATION
L2.03.01 ENLARGED PLAZA LAYOUT PLAN	A2.2 ELEVATION
L2.03.02 ENLARGED PLAZA PAVING PLAN	A3.1 SECTION
L2.03.03 ENLARGED PLAZA SCORE JOINT LAYOUT PLAN	A3.2 SECTION
L2.03.04 ENLARGED PLAZA SCORE JOINT LAYOUT PLAN	S4.1 FOUNDATION PLAN
L3.03 GRADING PLAN	S4.2 STRUCTURAL CMU PLAN
L4.00 IRRIGATION LEGEND AND NOTES	S5.1 FOUNDATION DETAILS
L4.01 IRRIGATION PLAN	S5.2 FOUNDATION DETAILS
L4.02 IRRIGATION PLAN	S6.1 CMU REBAR LAYOUT
L4.03 IRRIGATION PLAN	S6.2 STRUCTURAL CMU DETAILS
L4.04 IRRIGATION PLAN	S7.1 ROOF FRAMING PLAN
L4.05 IRRIGATION PLAN	S9.1 ROOF CONNECTION DETAILS
L4.06 IRRIGATION PLAN	S9.2 ROOF CONNECTION DETAILS
L4.07 IRRIGATION DETAILS	S9.3 ROOF CONNECTION DETAILS
L4.08 IRRIGATION DETAILS	S9.4 T&G LAYOUT FOR OVERHANGS (GABLE END)
L4.09 IRRIGATION DETAILS	A10.1 ROOFING PLAN
L4.10 IRRIGATION DETAILS	A11.1 ROOFING DETAILS
L4.11 IRRIGATION WATER USE CALCULATIONS	A12.1 DOOR SCHEDULE
L5.00.01 PLANTING LEGEND	A13.1 DOOR DETAILS - SIDING & EXTERIOR
L5.00.02 PLANTING LEGEND	A14.1 WINDOW / VENT SCHEDULE
L5.00.03 SOIL AMENDMENT PLAN	A15.1 WINDOW / VENT SIDING & INTERIOR
L5.01 PLANTING PLAN	A16.1 WALL FINISH SCHEDULE (INTERIOR/EXTERIOR)
L5.03 PLANTING PLAN	A17.1 WALL FINISH DETAILS (INTERIOR/EXTERIOR)
L5.04 PLANTING PLAN	A18.1 ADA CLEARANCES
	A20.1 INTERIOR ELEVATION / MOUNTING HEIGHTS
	P1 PLUMBING SCHEDULE
	P2 PLUMBING PLAN

Some common sheet numbering schemes:

Ax.xx or Axxx	Architecture
Cx.xx or Cxxx	Civil Engineering
Lx.xx or Lxxx	Landscape

where each sheet series has its own number:

L0.00	Cover Sheet
L0.01	General Notes and Codes
L1.00	Site Protection Notes and Legend
L1.01	Site Protection Plan – NE
L1.02	Site Protection Plan – SW



1.2 Produce Existing Conditions and Demo Plan

- **ALTA/NSPS Land Title Survey** – Comprehensive survey that documents improvements (physical items like buildings, pavements, existing trees), right-of-way, easements, boundaries, and restrictions on a piece of land. Follows strict national standards to ensure lenders receive consistent information regardless of location in the United States. ALTA surveys can take weeks or months to prepare.
- **Boundary Survey** – Much simpler. Combines field and records research to confirm a parcel's corners and boundary lines. Boundary surveys may include easements and encroachments. Sometimes known as 'setting stakes. Any new markers must be reported to the Assessor. They will be added to the plat map kept there.
- **Topographic surveys** Elevations only, spots and/or contours. What contour interval? Entire site or just the area that will be altered?
- **Construction surveys** put temporary stakes in the ground for construction
- **As-built surveys** document what was actually constructed in the field
- **Route surveys** - transportation and energy/utility projects - combination of boundary surveys and topographic surveys that identify locations of natural and man-made features, ownership, utilities, pipelines, power lines, highways, railroads, river crossings, landowner easements along the project route.
- **Floodplain Surveys/Elevation Certifications** – A property must have a flood certification for insurance or new construction- if structure is in a floodplain.

US Public Lands Survey System

Used in all but 18 states (13 colonies, WV, TN, KY, TX, HI)

Section: The basic unit of the system, a square piece of land one mile by one mile containing 640 acres.

Township: 36 sections arranged in a 6 by 6 square, measuring 6 miles by 6 miles. Sections are numbered beginning with the northeast-most section (#1), proceeding west to 6, then south along the west edge of the township and to the east (#36 is in the SE corner).

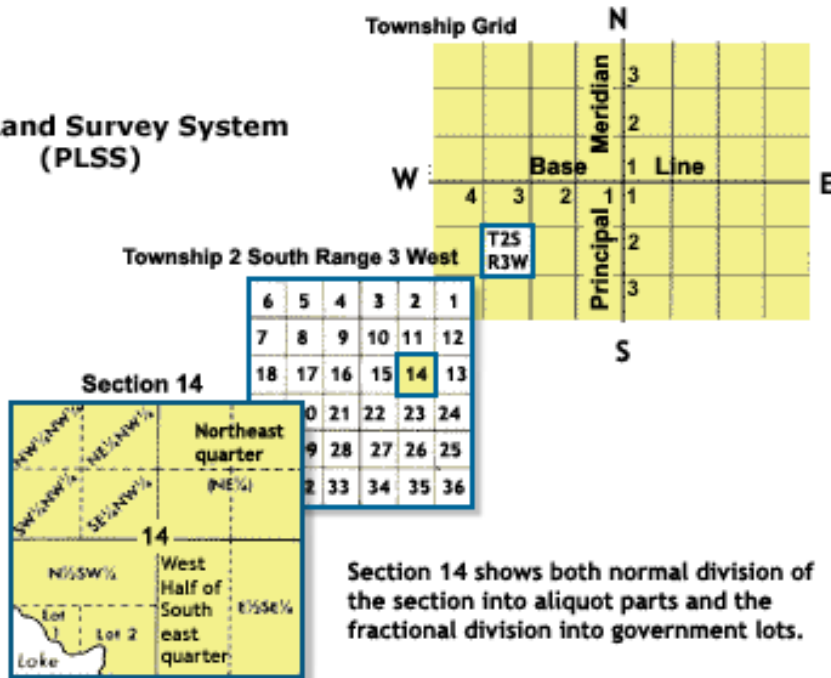
Range: Assigned to a township by measuring east or west of a Principal Meridian

Range Lines: The north to south lines which mark township boundaries.

Principal Meridian: The reference or beginning point for measuring east or west ranges. Map of meridians & base lines from the BLM web server

Base line: Reference or beginning point for measuring north or south townships.

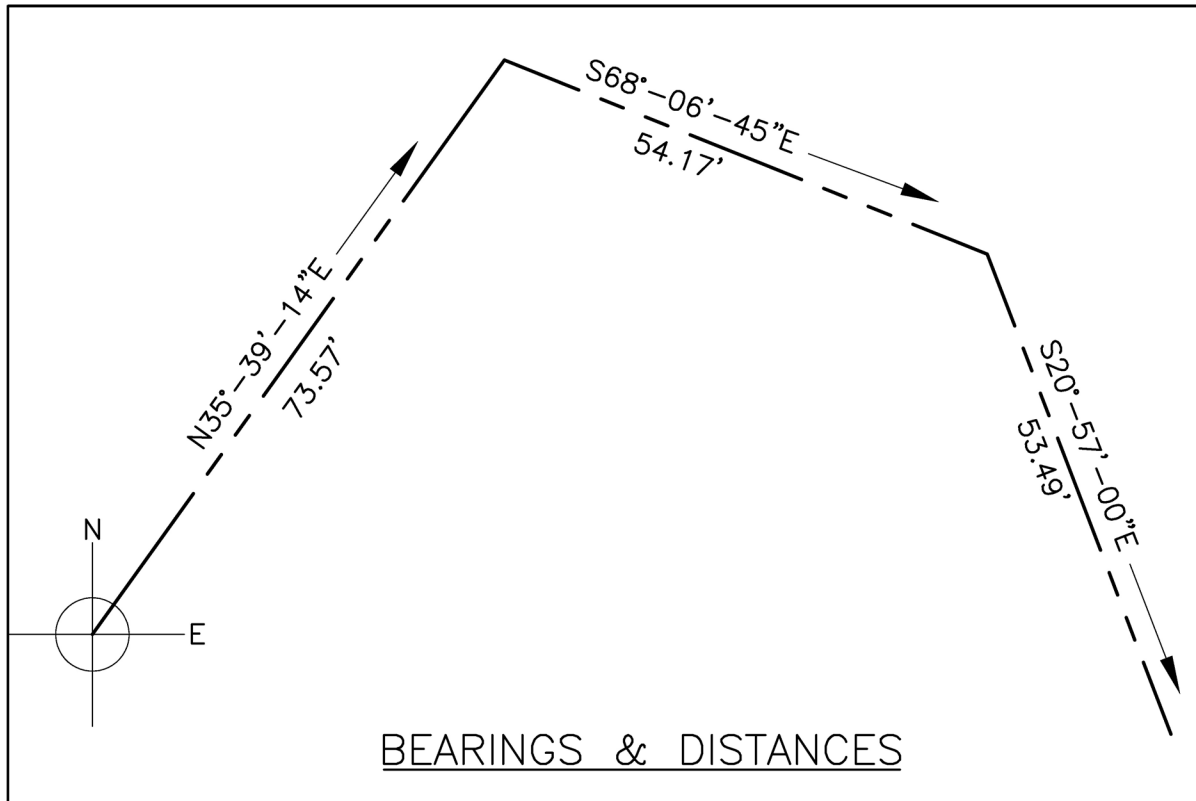
Public Land Survey System (PLSS)



<https://web.gccaz.edu/~lynrw95071/Township%20Range%20Explanation.html>

Metes and Bounds System

- Used in 18 states, plus parcels smaller than 1/4 section (160 ac)



Graphic Scale



Surveying: Vertical Controls

A *Benchmark* is a fixed point on the ground whose location and relative elevation is known, marked by temporary or permanent markers, and usually shown on a topographic survey. Benchmarks are set by the US Geological Survey, state or local governments, or surveyors.



A *Temporary Benchmark* (TBM) is generated by a surveyor by working from an established benchmark and then providing a fixed marker on or near the site which can be used by the Contractor's surveyor as the vertical control for the project.

1.3 Produce Protection and Mitigation Plan

Mitigation plans-often associated with wetlands but any impact can be mitigated. VSPZ – Vegetation and Soil Protection Zone

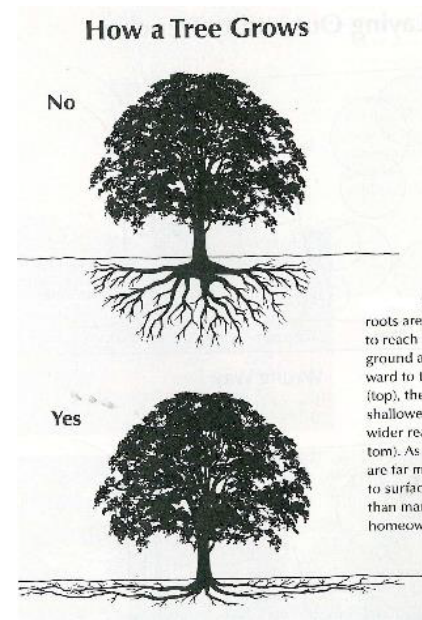
- **To protect:** to avoid disturbing a resource so it continues in its pre-construction condition after work is complete
- **To mitigate:** to allow disturbance, but reduce the negative impacts of construction activities or development.

Mitigation might look like many things:

- Providing extra support for something that is stressed
- Restoring something that has been degraded
- Replacing something that is destroyed
- Paying a fine and providing money for mitigation to happen elsewhere

Tree protection measures:

- Tree survey/arborist report
- Limit of construction line
- Staging areas/good housekeeping/heavy equipment routes
- Financial penalties
- Arborist on site when work takes place near trees



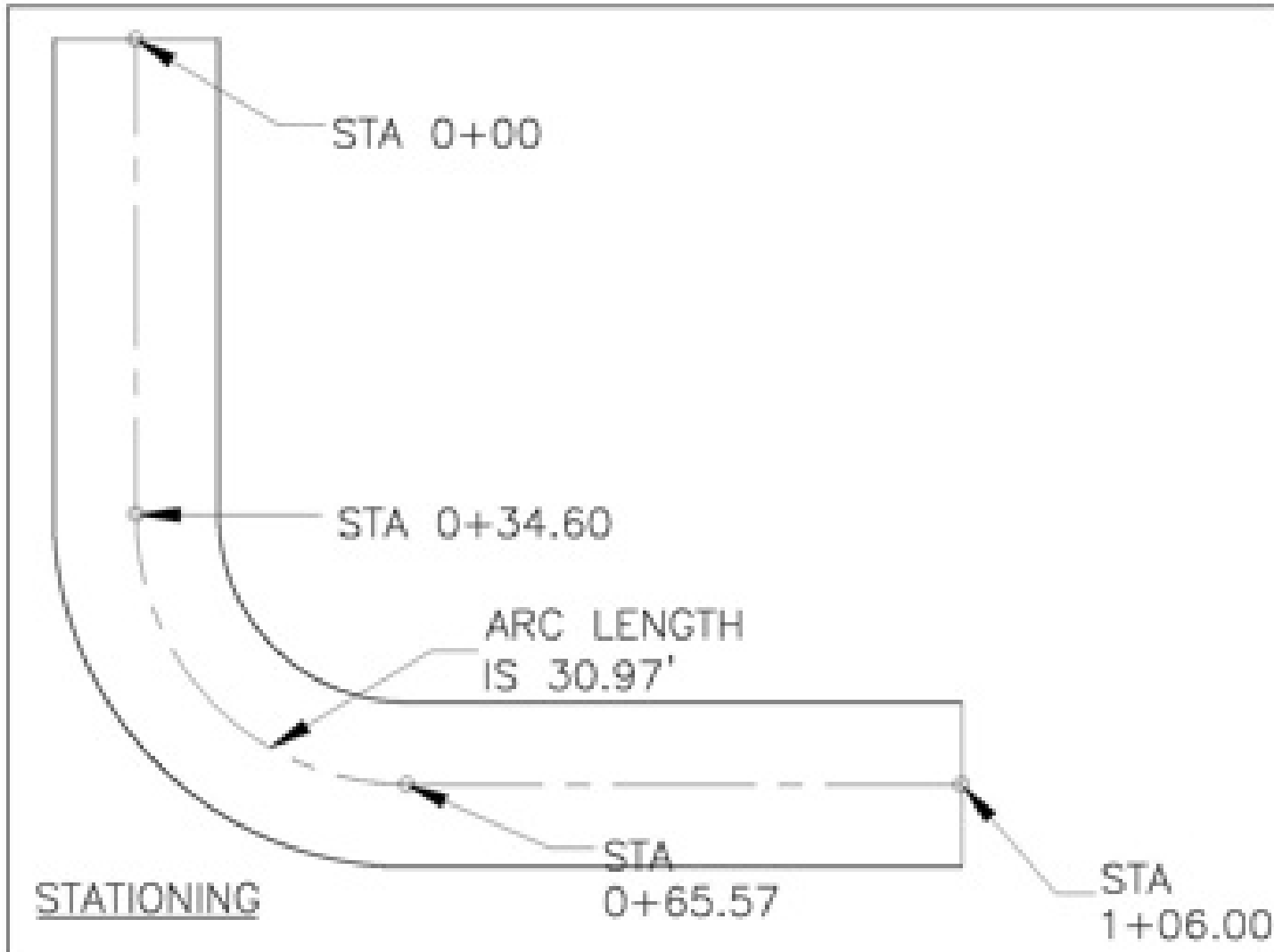
1.4 Produce Layout and Materials Plan

- **Fixed Construction** should be laid out to the highest order of accuracy. Property lines, right of ways, easements, and structures located on property lines - 1/1000th of a foot
- **Semi-Fixed Construction** most hardscape and structural elements on a site - 1/8" or 1/100th of a foot. This is standard construction tolerance.
- **Adjustable Elements** may be located after all or the more critical elements on the site have been located. These do not require a high degree of accuracy - plant materials, trails

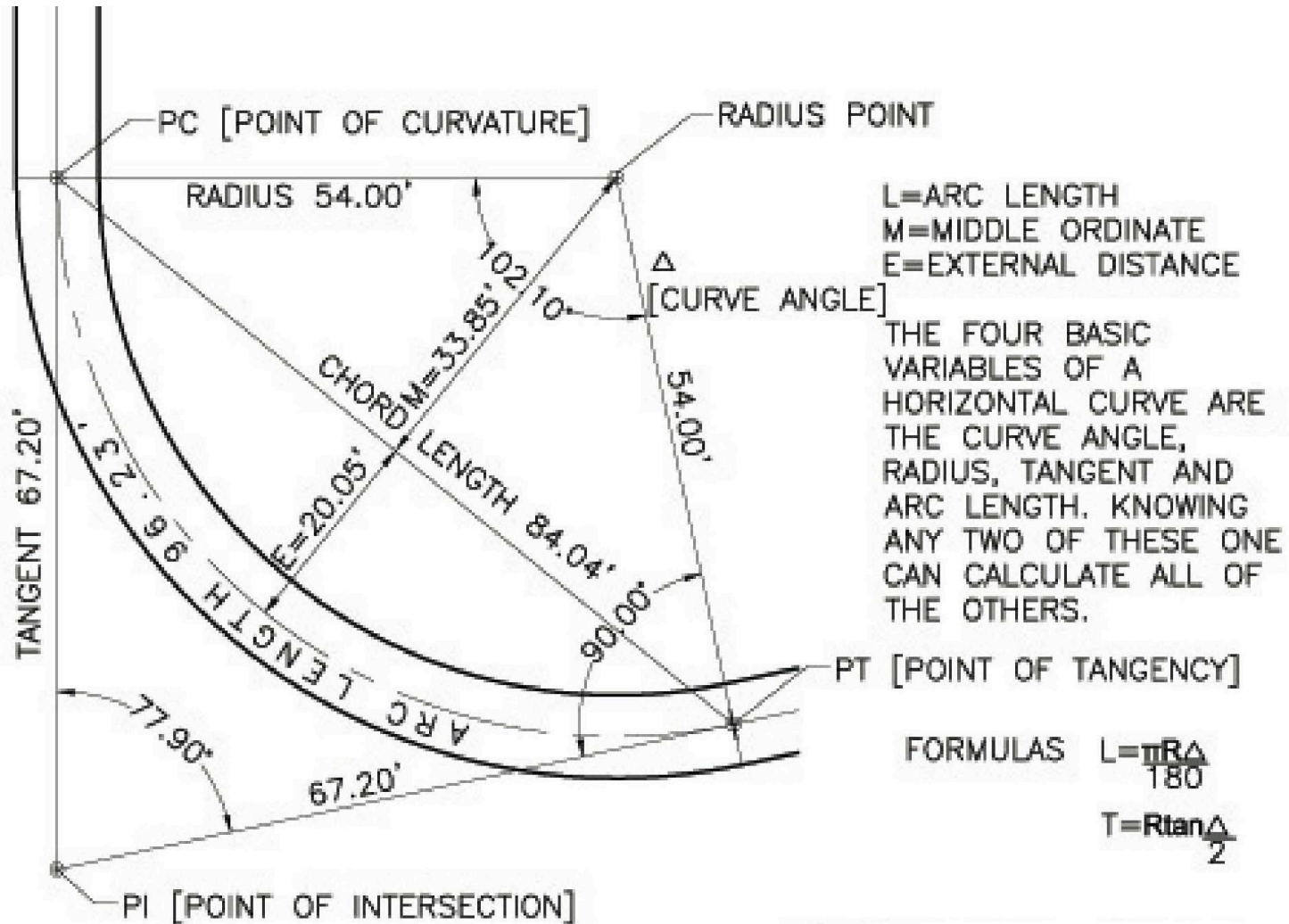
Standard Dimensioning Techniques

- Running Dimensions: Architectural Plans
- Baseline Dimensioning:
- Stationing System: Roads, utility lines, other linear work
- Bearings and Distances: Property lines
- Azimuths: Angles measured clockwise from true north
- Offsets: To get around obstructions
- Horizontal Curves
- Grid (Cartesian) Coordinates

Stationing System

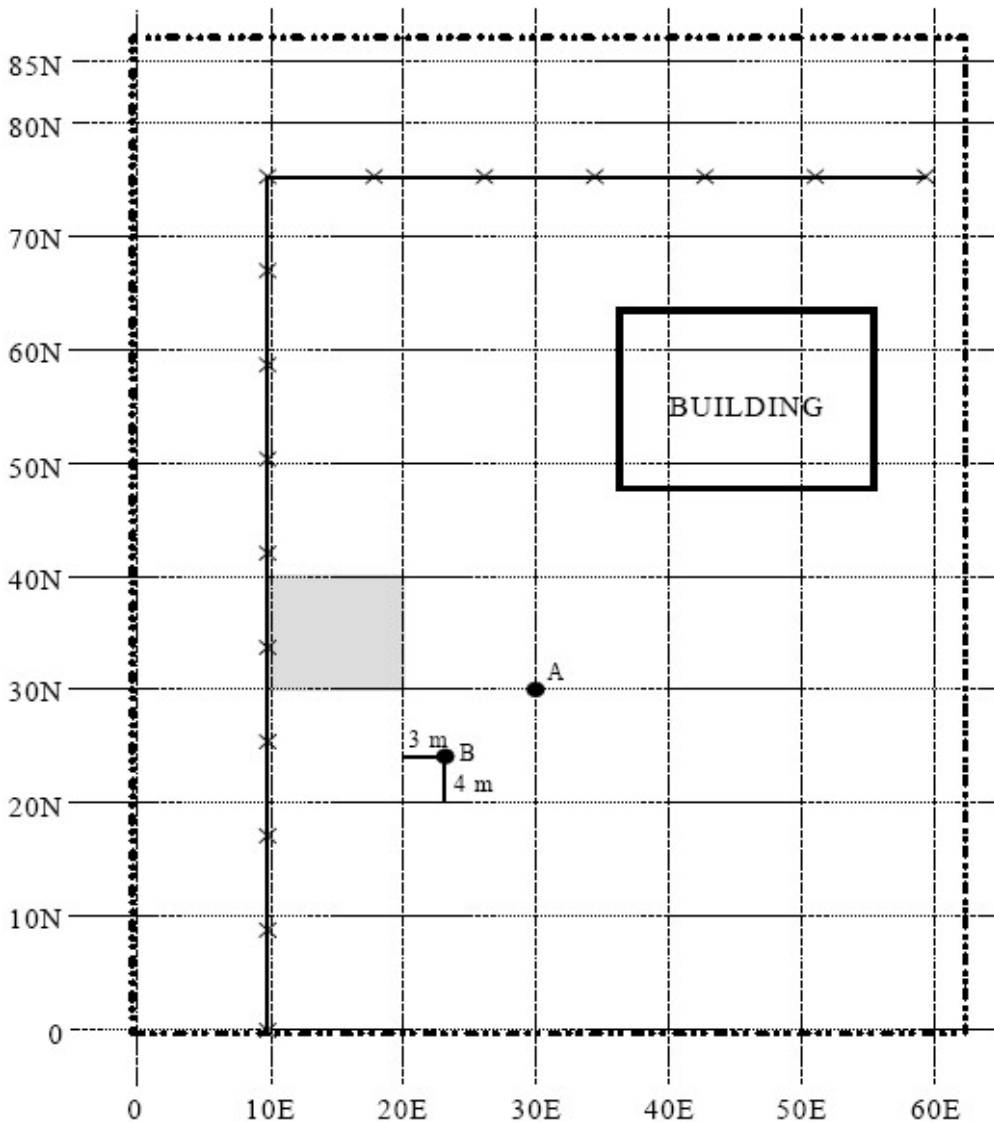


Circular Curves



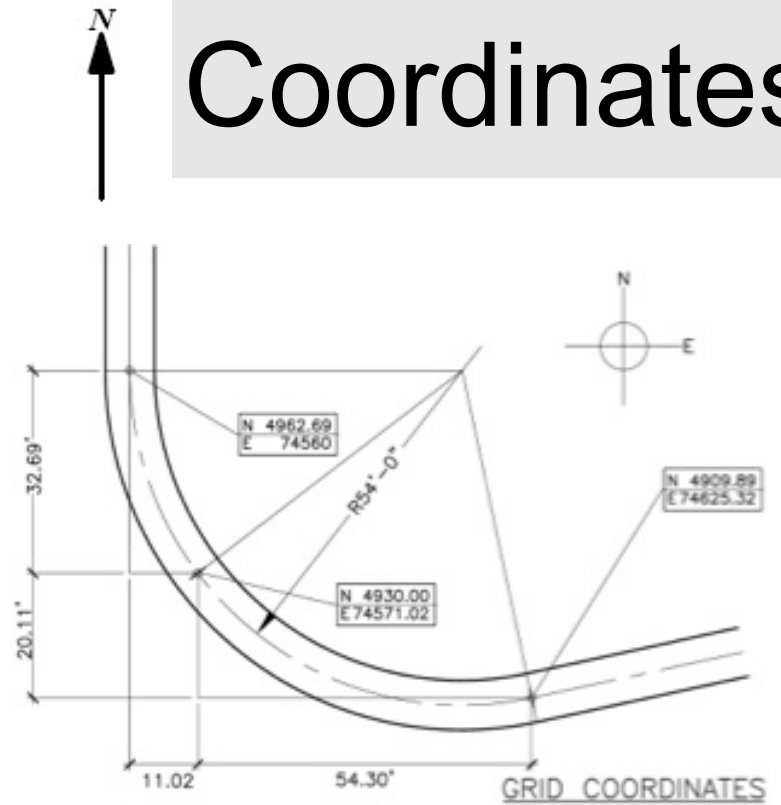
Most layout plans use circular curves. In addition to a starting point and tangential direction, curves require at least two other elements to lay out. The 4 standard elements of a curve are angle, tangent length, arc length, and radius. Any 2 of these are sufficient to calculate the others.

Coordinates



POINT A GRID COORDINATES 30E, 30N
 POINT B GRID COORDINATES 23E, 24N
 SHADED BLOCK GRID COORDINATES 10E, 30N

----- SURVEY UNIT BOUNDARY
 x-x-x-x ONSITE FENCE



Top left Coordinate	N4962.69	E74560.00
Grid distance to Middle Coord.	-32.69	+11.02
Middle Coordinate	N4930.00	E74571.02
Grid distance to Right Coord.	-20.11	+54.30
Right Coordinate	N4909.89	E74625.32

To Calculate the Horizontal Distance from the Top Left to the Right Coordinate:

N4962.69	E74560.00
-N4909.89	-E74625.32
52.80	34.68

$$C = (52.80)^2 + (34.68)^2 = (4003.06)^{0.5} = 63.27 \text{ feet}$$

Utilities: Cover and Separation

Dry Utilities should be trenched separately from wet utilities. Standards are set locally. Easier to route than wet utilities.

Wet Utilities:

- Sanitary Sewer is always installed below water lines and typically below storm drain lines. Vertical and horizontal separation req' d. by code.
- Reclaimed water systems are also installed below potable water systems.
- Sanitary and Storm Sewers rely on gravity to maintain flow in pipes.
- Minimum cover requirements depend greatly on local frost depths.

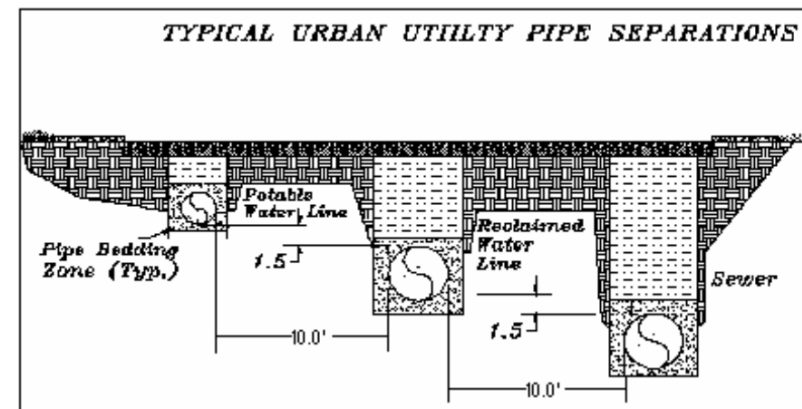
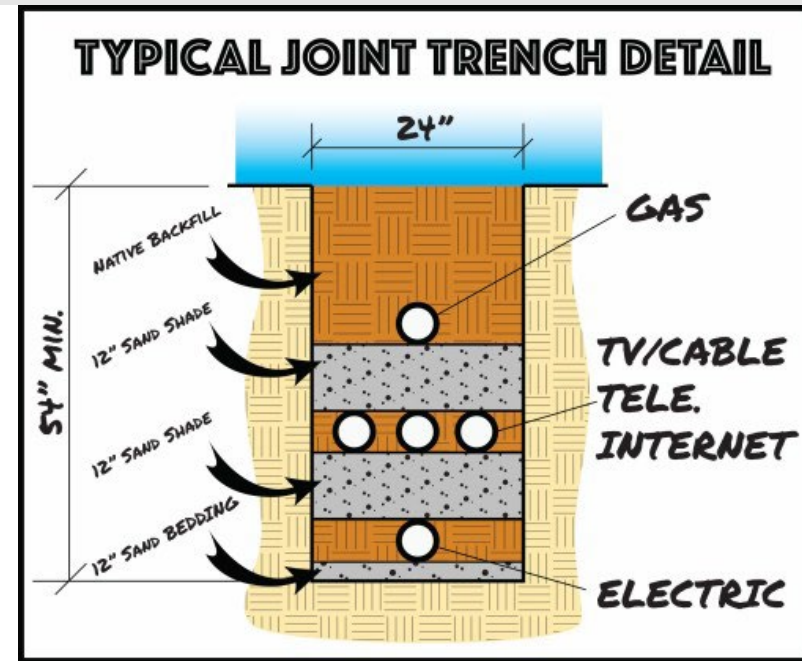
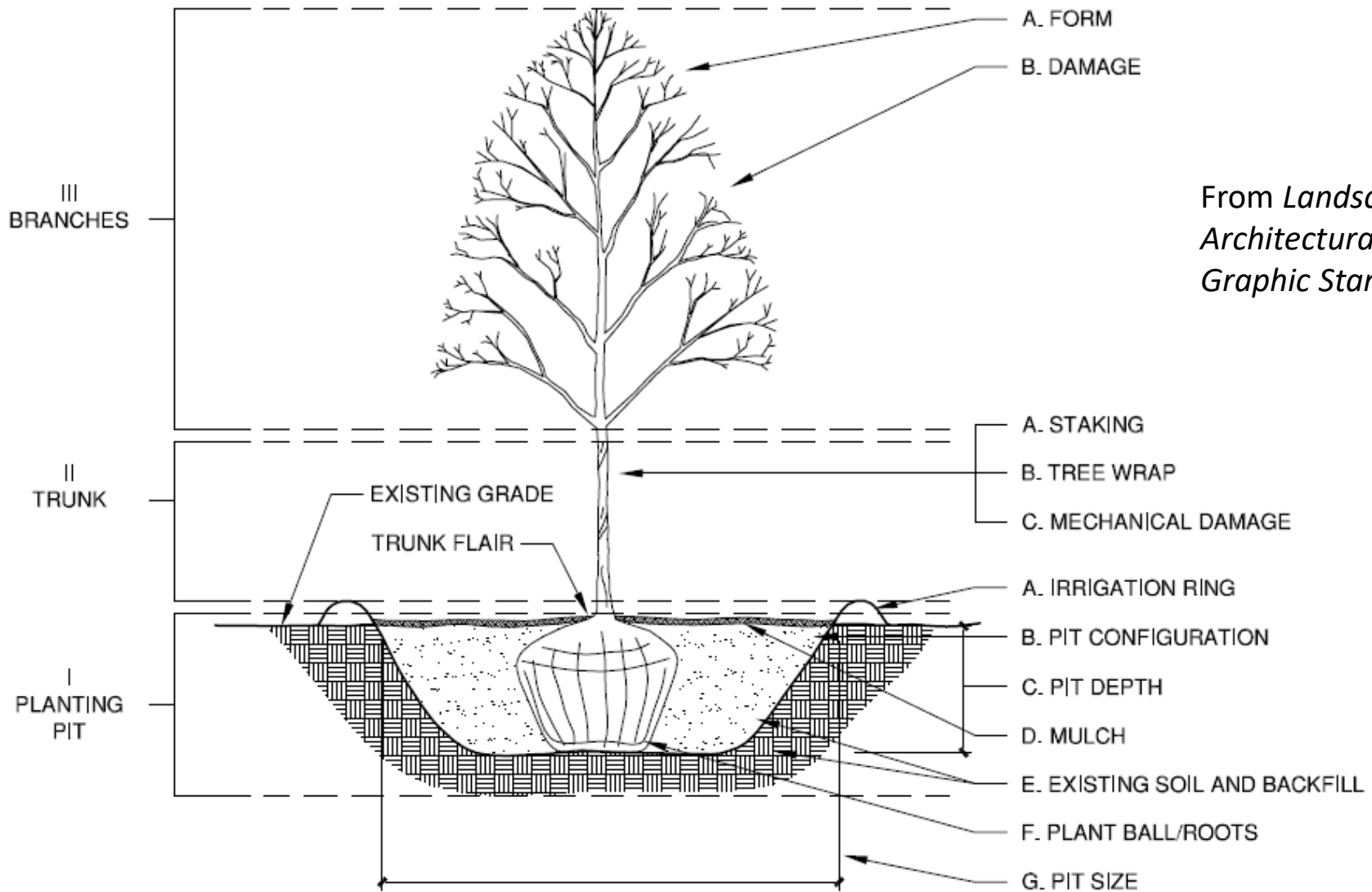


Figure 7: Standard horizontal pipe separation detail

1.5 Produce Planting Plans & Details



From *Landscape Architectural Graphic Standards*

COMPONENTS OF A PLANTING DETAIL

1.6 Create Details, Elevations and Sections

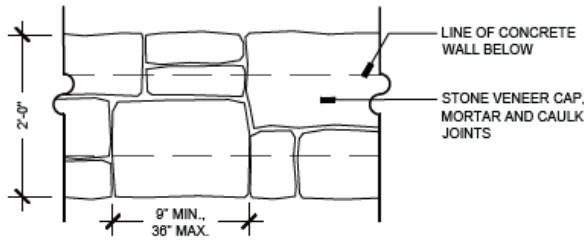
(e.g. walls, pavements, structures, specialty features, green roofs, drainage details)

Best Practices for Construction Detailing (from LADS)

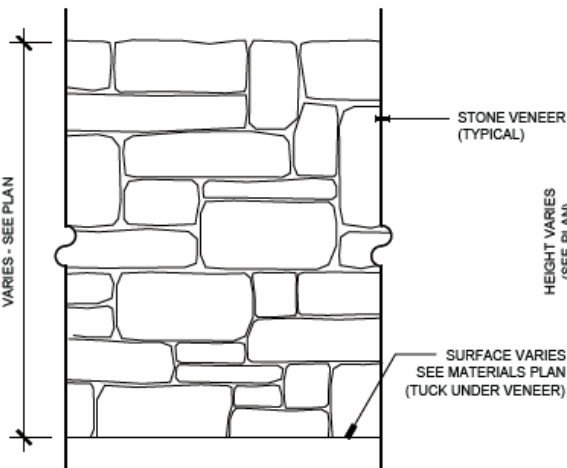
- During DD: Start by itemizing all materials, components, systems and conditions on the plans to make a preliminary detail list. Use library details and generate new sketch details as needed
- Avoid redundancy – show base condition in a master detail and then variations that refer back to it
- Use elevations and sections as needed
- Group related details on the same page
- Pay special attention to HSW: finishes; walking surfaces (non-slip); joints; fasteners; transitions between materials; full section to subbase; ADA clearances in section

A Well Composed Detail

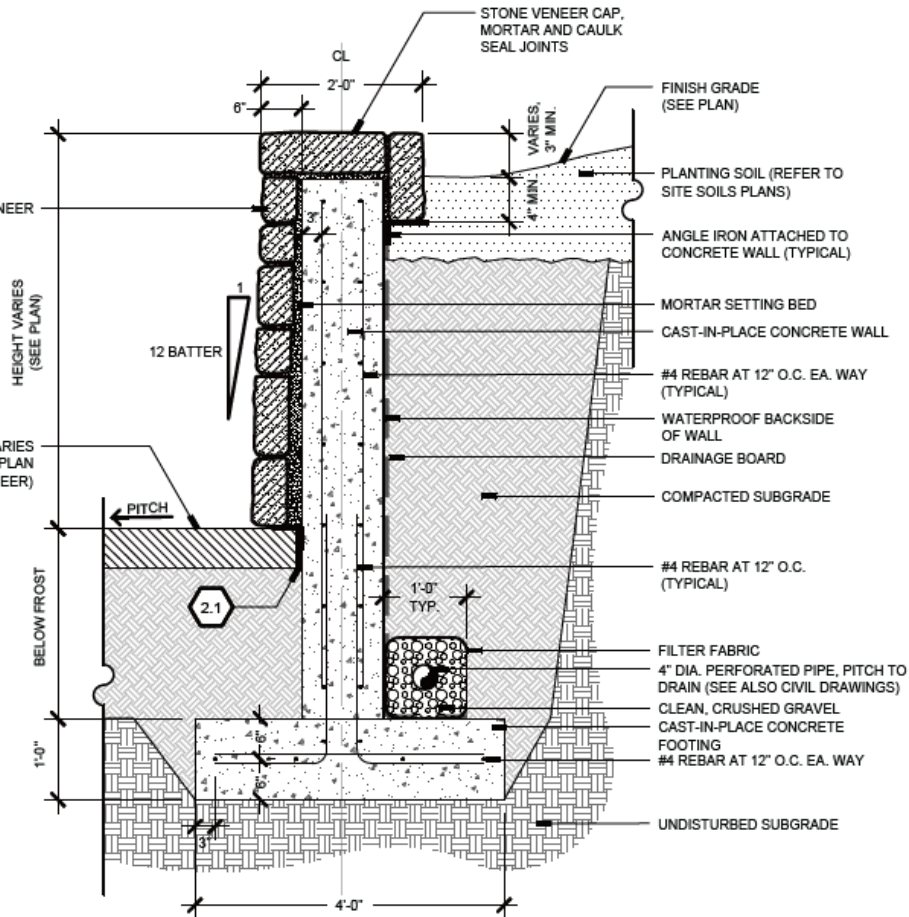
*Landscape Architectural
Design Standards*



PLAN



ELEVATION



SECTION

Structural Forces and Retaining Walls

Loads

There are three basic classifications of loads that can be applied to an anchor: tension, shear and oblique.

Tension load - A load that is applied parallel to the length of the anchor.

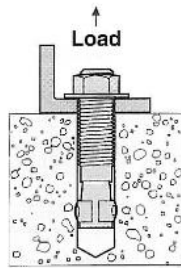
Shear load - A load that is applied perpendicular to the length of the anchor.

Oblique Load - A load that is applied to an anchor which can be resolved into tension and shear components. In the case of an oblique load, calculations using the appropriate interaction equation should be performed to ensure that the anchor is not overstressed.

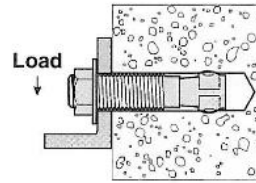
In addition, the preceding loads may be further classified as either static or dynamic.

Static Load - A load whose magnitude does not vary appreciably over time. An example of this classification of loading includes the self weight of a supported fixture.

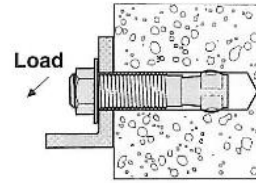
Dynamic Load - A load whose magnitude varies over time. seismic, vibratory and fatigue loads are examples of dynamic loads.



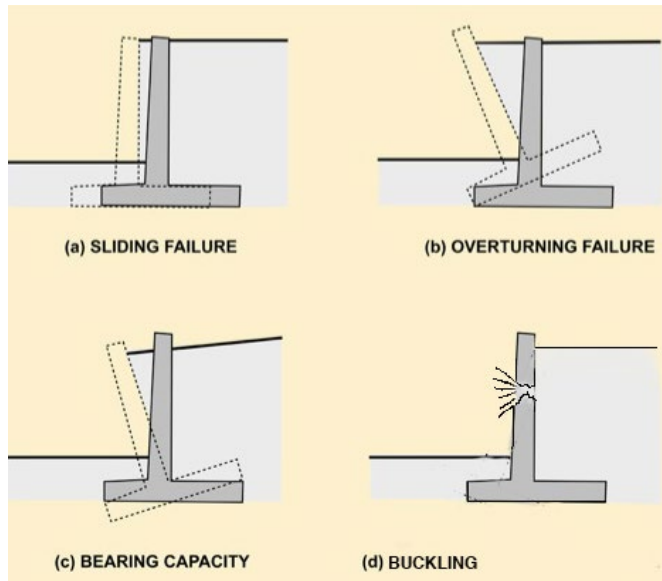
Tension Load



Shear Load



Oblique Load
(Combination Load)



Know the ways retaining walls fail and the major types of retaining walls.

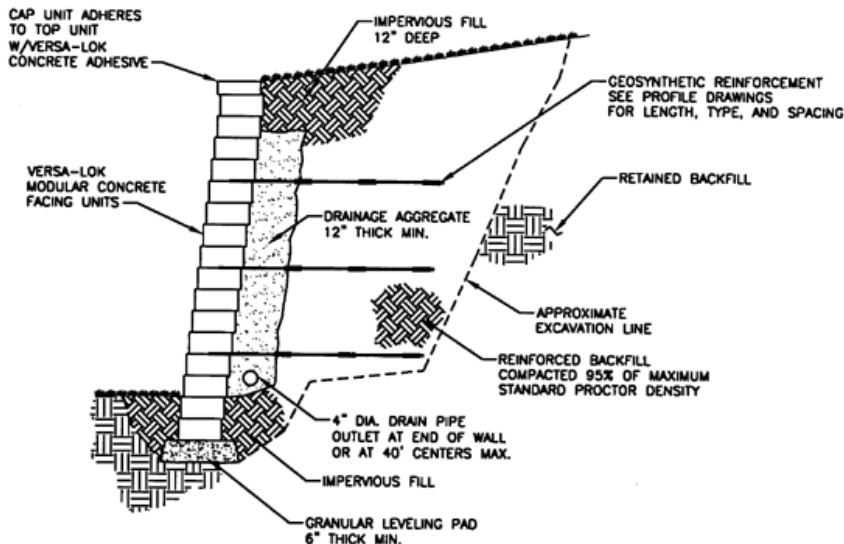
Types of Gravity Retaining Walls

Drystack – often has a batter

Gabion – cages full of stone

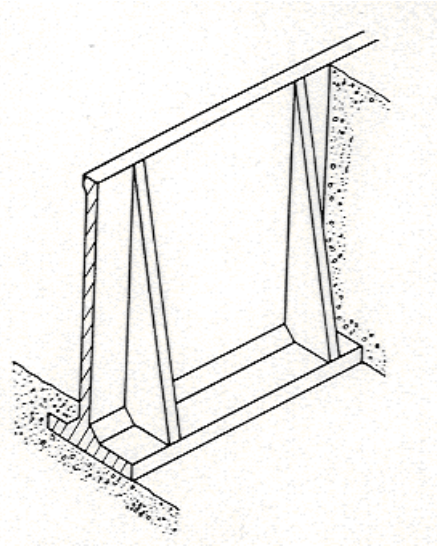
Crib Walls – can be wood, concrete or metal. Interlock at each corner

Precast Modular Concrete Walls

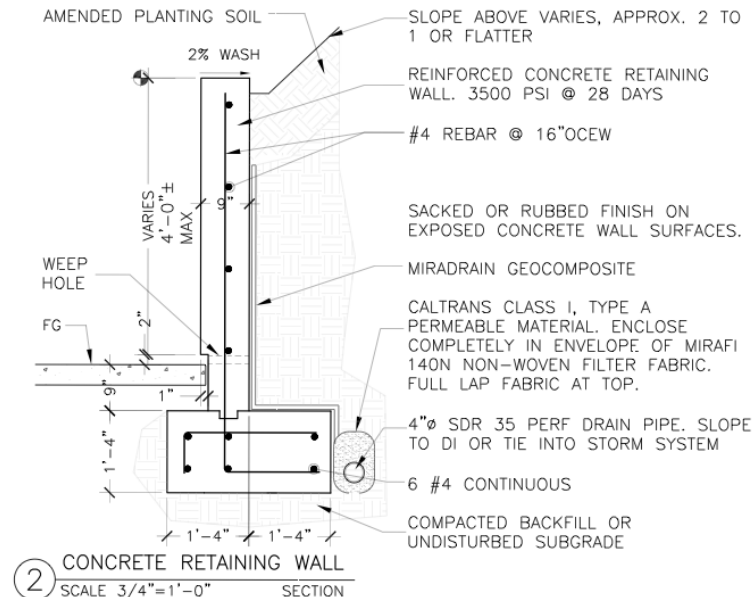


Types of Engineered Retaining Walls

Counterfort Wall – has buttresses that hold the wall rigid



Cantilevered Wall – look for adequate rebar size, continuous connection, drainage behind wall, 'T' shaped footing on both sides



Pavements – Rigid and Flexible

Rigid Pavements rely on a concrete slab. It can be the finish surface or it can be a base for decorative paving surfacing. It can be reinforced with rebar or welded wire mesh.

- Curb Ramp Detail
- Unit Pavers Mortared to Slab

Flexible Pavements have an aggregate base support course just like concrete but rely on edge support to keep pavement in compression.

- Sand Set Pavers (impermeable or permeable)
- Gravel/Rock Dust/Quarry Fines/Decomposed Granite
- Asphalt

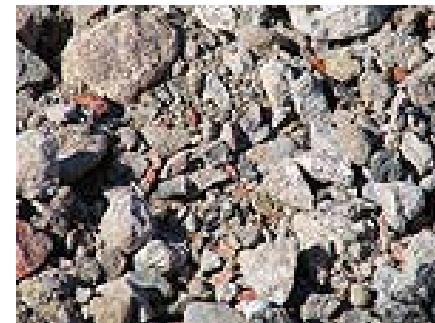
Aggregate Base is critical for all pavements. The depth determines how much load the pavement can bear – the design section. Depth is given by the Geotech report – how strong are site soils?

Aggregate Base



AB – angular
crushed rock,
good distribution
of particle sizes

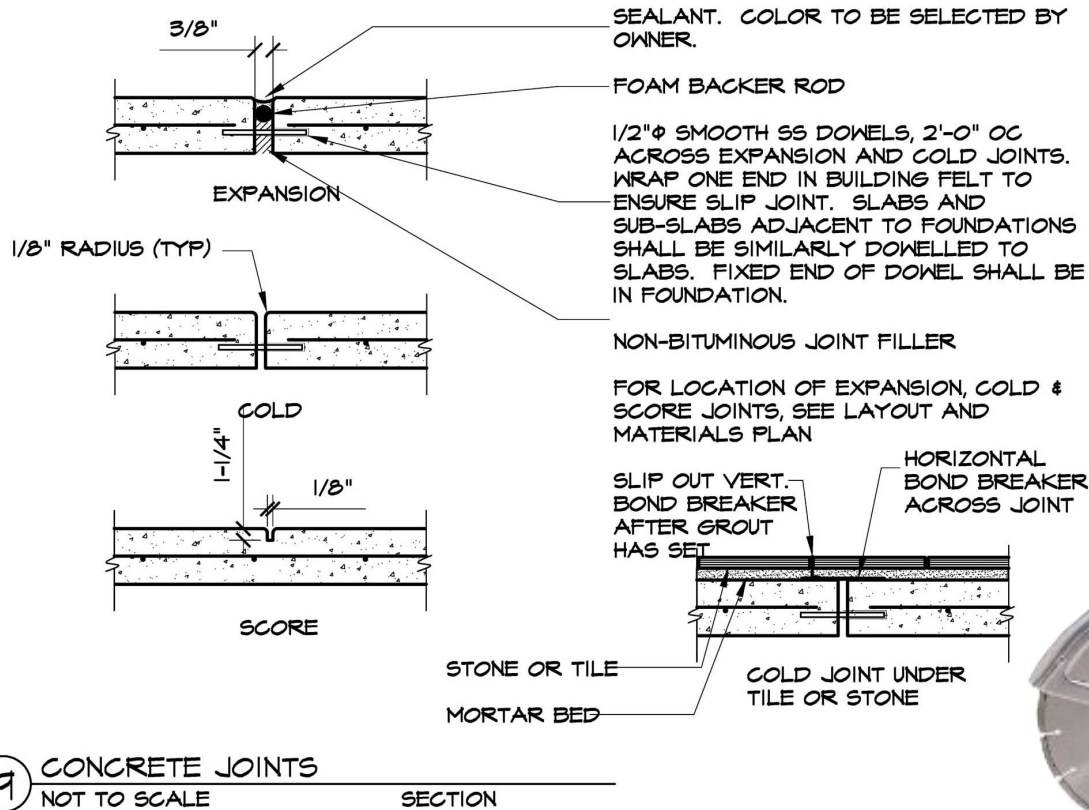
Recycled AB – crushed
recycled concrete



Concrete: A Rigid Pavement

- Concrete is a mixture of cement, aggregate and water. Cement contains lime, silica, aluminum and gypsum. Cement is the binding agent. Water is the catalyst. Aggregates provides strength and volume.
- Too much water will reduce the strength of concrete.
- Heat of hydration is the heat released during the curing process.
- Admixtures may be added to speed up or retard curing, improve workability or flowability, add air, or change color.

Concrete Joints



Edger



Groover

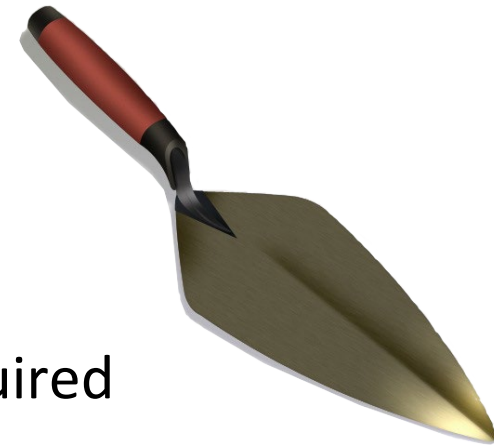
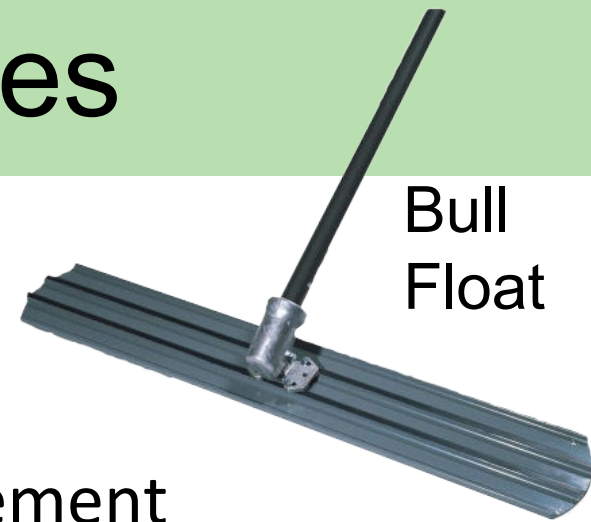


Concrete Saw

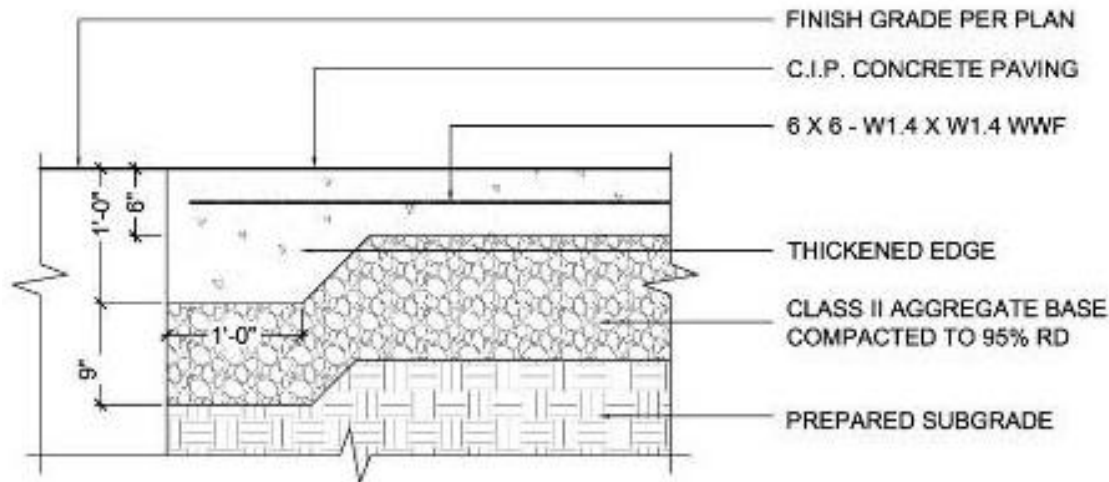
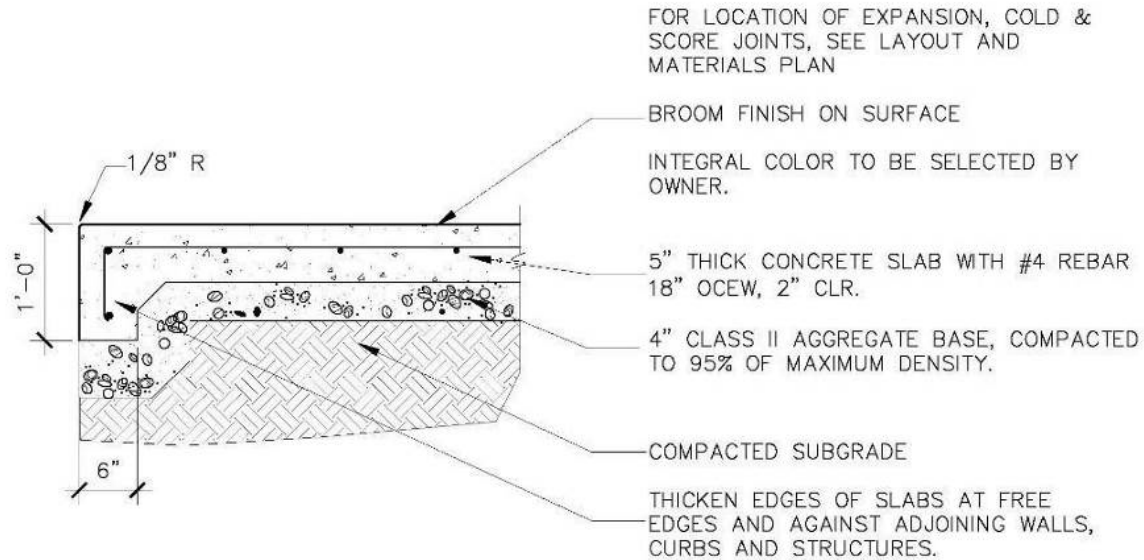
- Score: crack control during shrinkage
- Expansion: prevents end crushing during thermal expansion
- Cold: End of day pour or EJ without filler.

Concrete Finishes

- For aesthetics and slip resistance
- Float: Preliminary leveling pass
- Trowelled: Too slick for outdoor pavement
- Broom: Good slip resistance
- Sandblast: Can be used to expose aggregate depending on depth
- Salt: Not good in freezing climates
- Exposed Aggregate
 - Top Seeded: by washing and brushing
 - Integral: heavier washing and brushing required
- Non-Pavement Finishes
 - Bush hammered, form materials, form liners



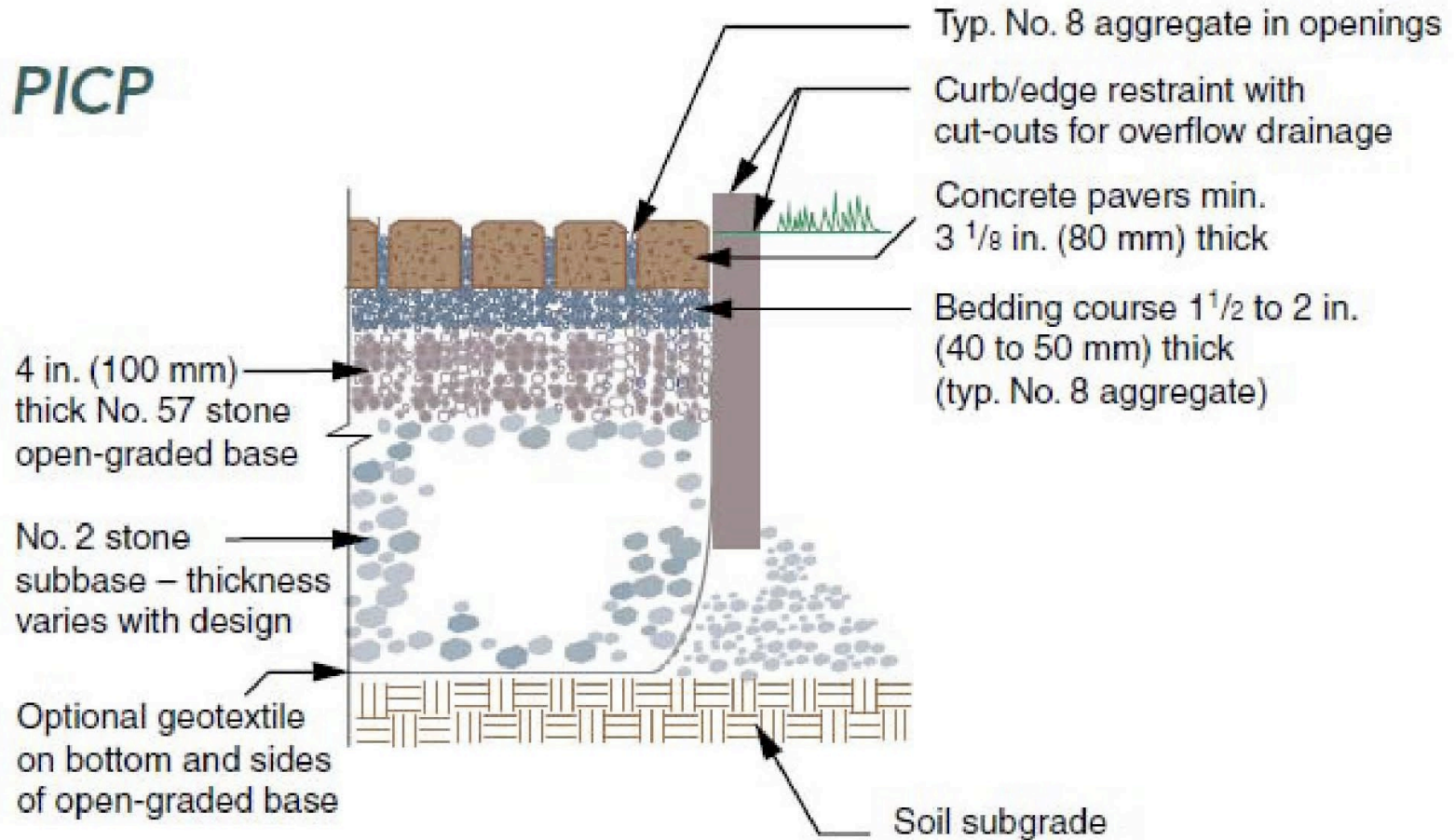
Concrete Flatwork details



VEHICULAR

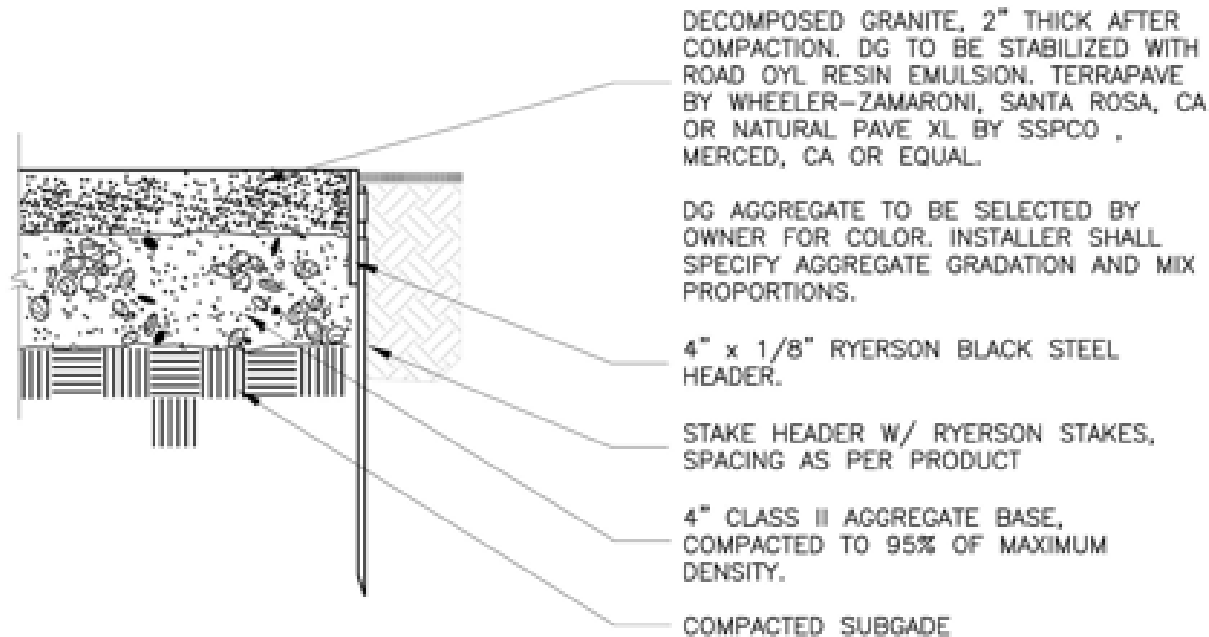
Permeable Interlocking Concrete Pavers

PICP



Source: Interlocking Concrete Pavement Institute – www.icpi.org

Aggregate Pavement & Headers

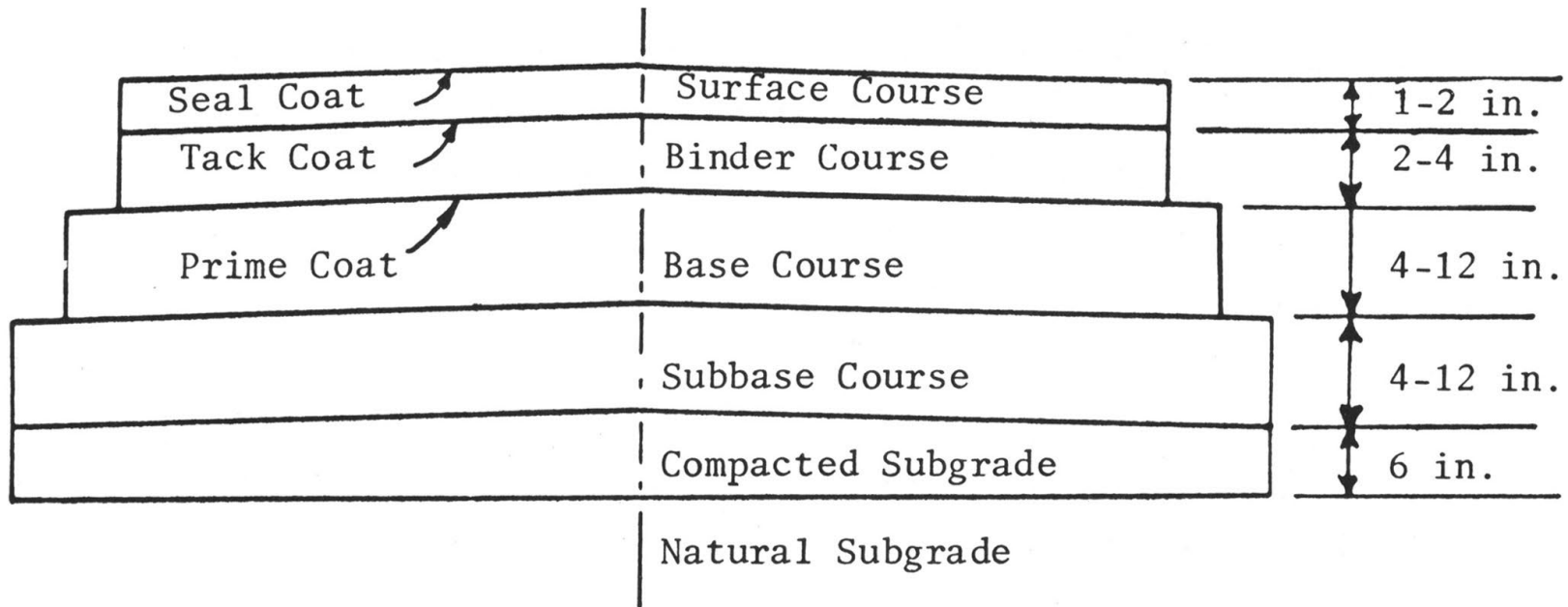


② DECOMPOSED GRANITE PAVING
SCALE 3"=1'-0"

SECTION

- Headers are edge restraints to hold flexible or granular paving materials in place.
- Headers can be made of metal, wood, concrete or unit masonry.
- Bottom of the header should be at least below surfacing layer.
- A curb is a type of header that sticks up above grade.
- Most headers are flush with the surface.

AC Pavement Terms: Courses



Wearing Course: Largest aggregate is typically 1/2"-3/4".

Binder Course: Asphalt and aggregate mixture for use as exposed surface of paving profile. Largest aggregate is typically 3/4"+.

Base Course: Compacted aggregate. Typical range is 3/4" to <#300

Subbase Course: Compacted aggregate. Typical Range is 2-1/2" to <#300

Compacted Subgrade: Native soil or engineered fill compacted to 90-95%.

Seal Coat: Mixture of fine aggregates and slow setting emulsified asphalt to seal previously paved surface.

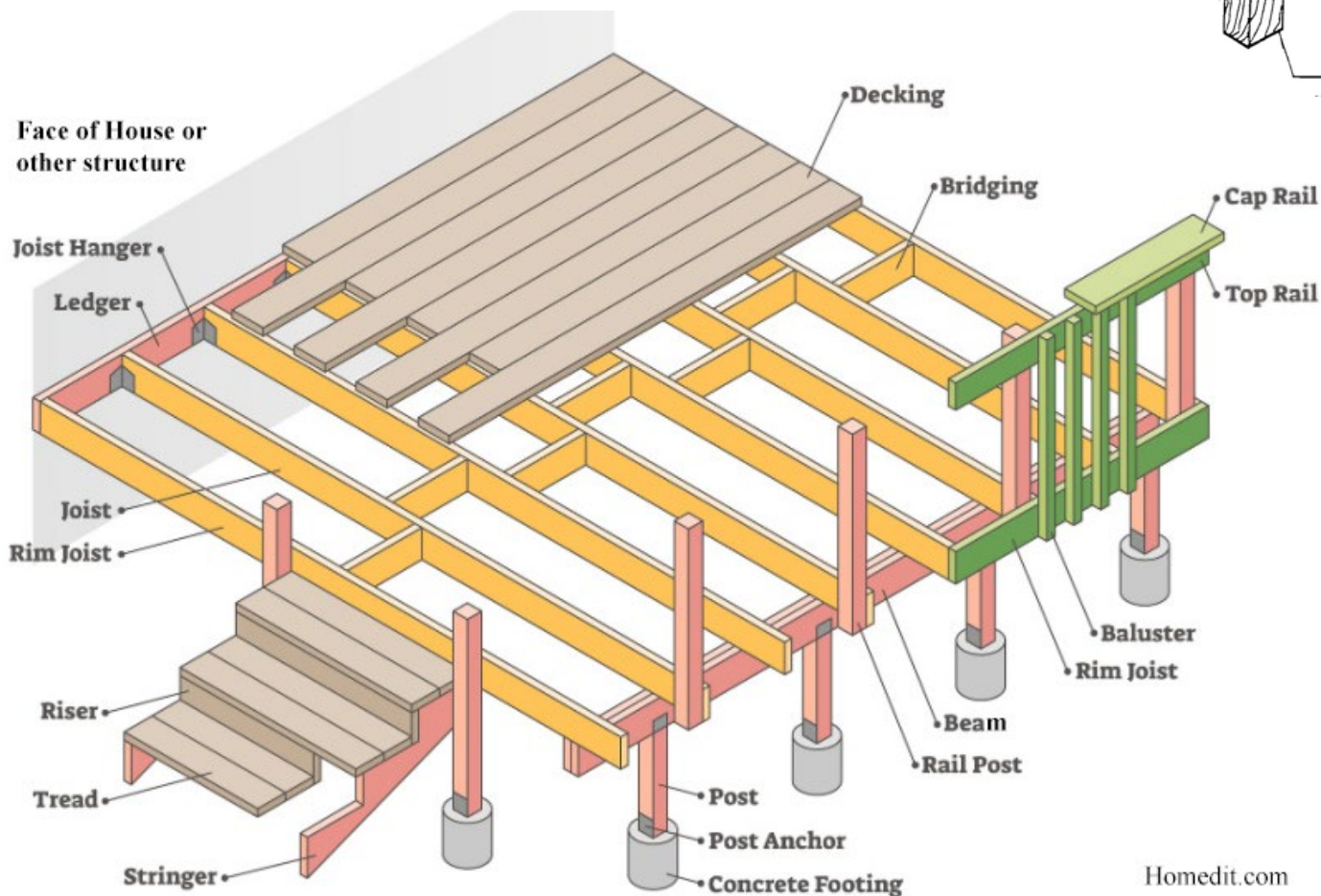
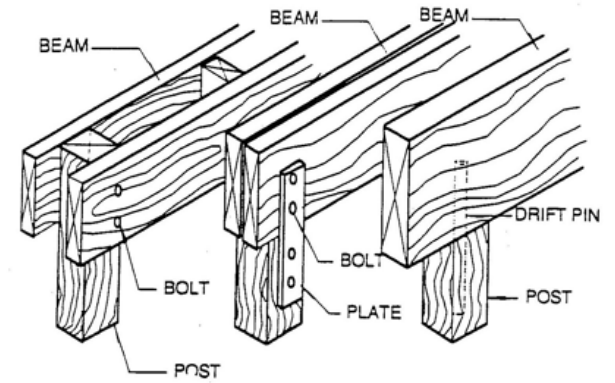
Tack Coat: A liquid coating of asphalt applied to the base course or existing surface to be paved.

Prime Coat: Layer of low viscosity asphalt to aggregate or sub-base to plug voids and prepare base for overlaying asphalt course.

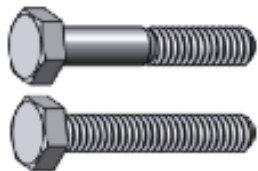
There are many types of seal coats: eg. fog, chip, slurry. Each describes a degree of thickness/roughness based on the aggregate size used.

Wood Detailing

Wood construction is based on stacked layers that reinforce each other and distribute the load from the decking down through the joists, beams, posts, and footings – down to the ground



Wood Fasteners



Hex Bolts

Bolts with a hexagonal head with threads for use with a nut or tapped hole. Abbreviated HHMB or HXBT.



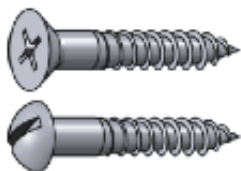
Carriage Bolts

Bolts with a smooth rounded head that has a small square section underneath.



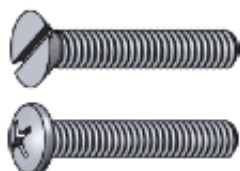
Lag Bolts

Bolts with a wood thread and pointed tip. Abbreviated Lag.



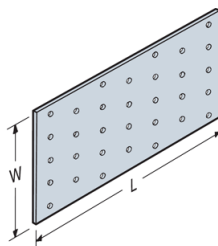
Wood Screws

Screws with a smooth shank and tapered point for use in wood. Abbreviated WS

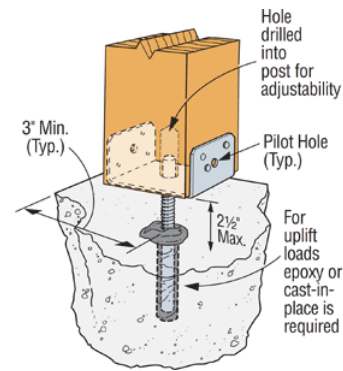


Machine Screws

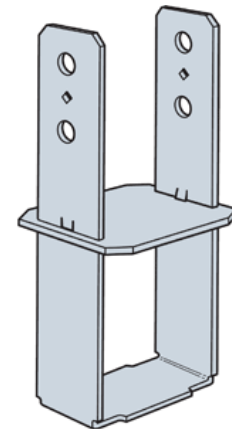
Screws with threads for use with a nut or tapped hole. Abbreviated MS



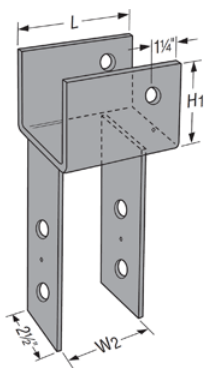
Tie Plate



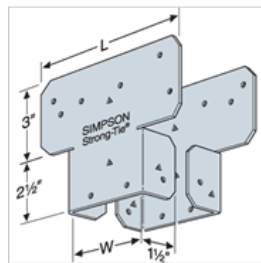
Column Base



Column Base



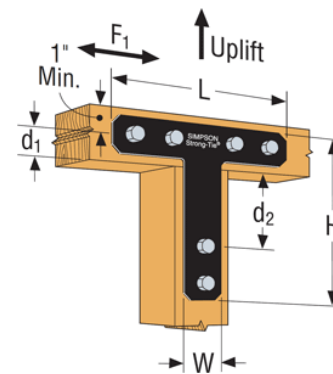
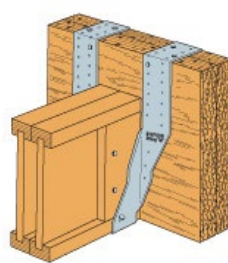
Post Cap



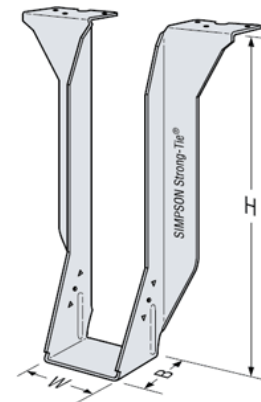
Post Cap



Strap Hanger

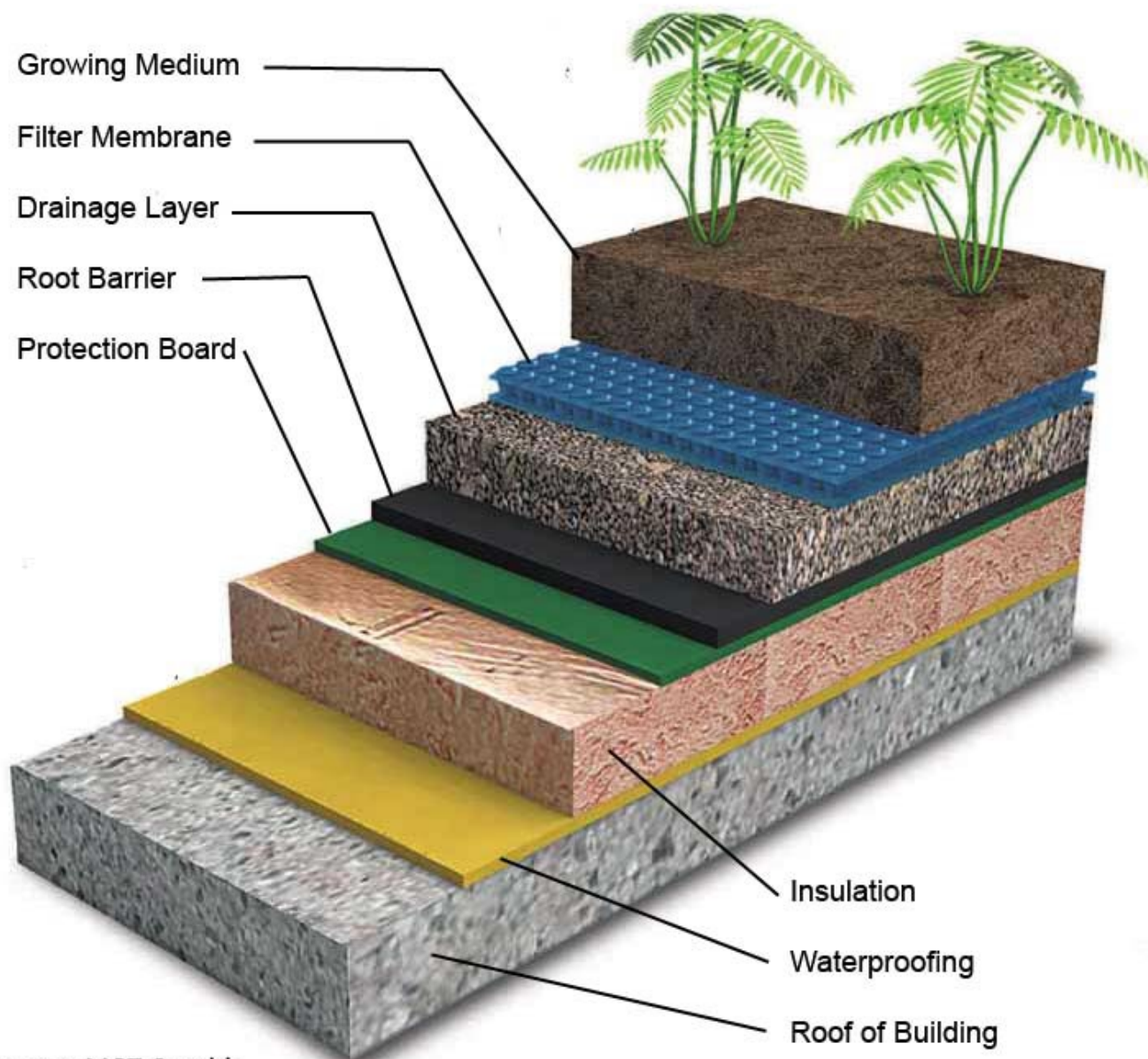


T Strap Tie



Joist Hanger

Green Roofs



Source: MCT Graphic

1.7. Collaborate on Supplemental Plans

(e.g. lighting, irrigation, playground, wayfinding)

LARE Concerns

- Safety: Illumination levels
- Aesthetics: Color rendering similar to sunlight
- Economy: Installation & Maintenance Costs

Terms

- Lumen: the power of light as perceived by the human eye
- Lux: one lumen per square meter
- Footcandle: one lumen per square foot
- Photometrics: light levels at varying distances from source

Optics: light pattern

- Type II=asymmetrical for lighting roads and paths
- Type IV=asymmetrical for lighting large areas from edge (parking lot)
- Type V=circular pattern (plazas, center of parking lots)

Color Rendering: reproduction of color close to that of the sun

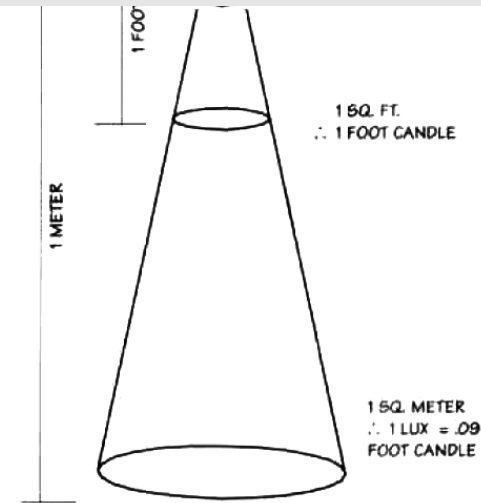
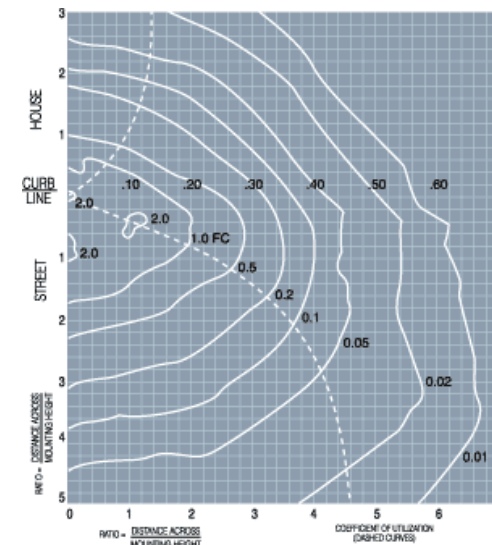
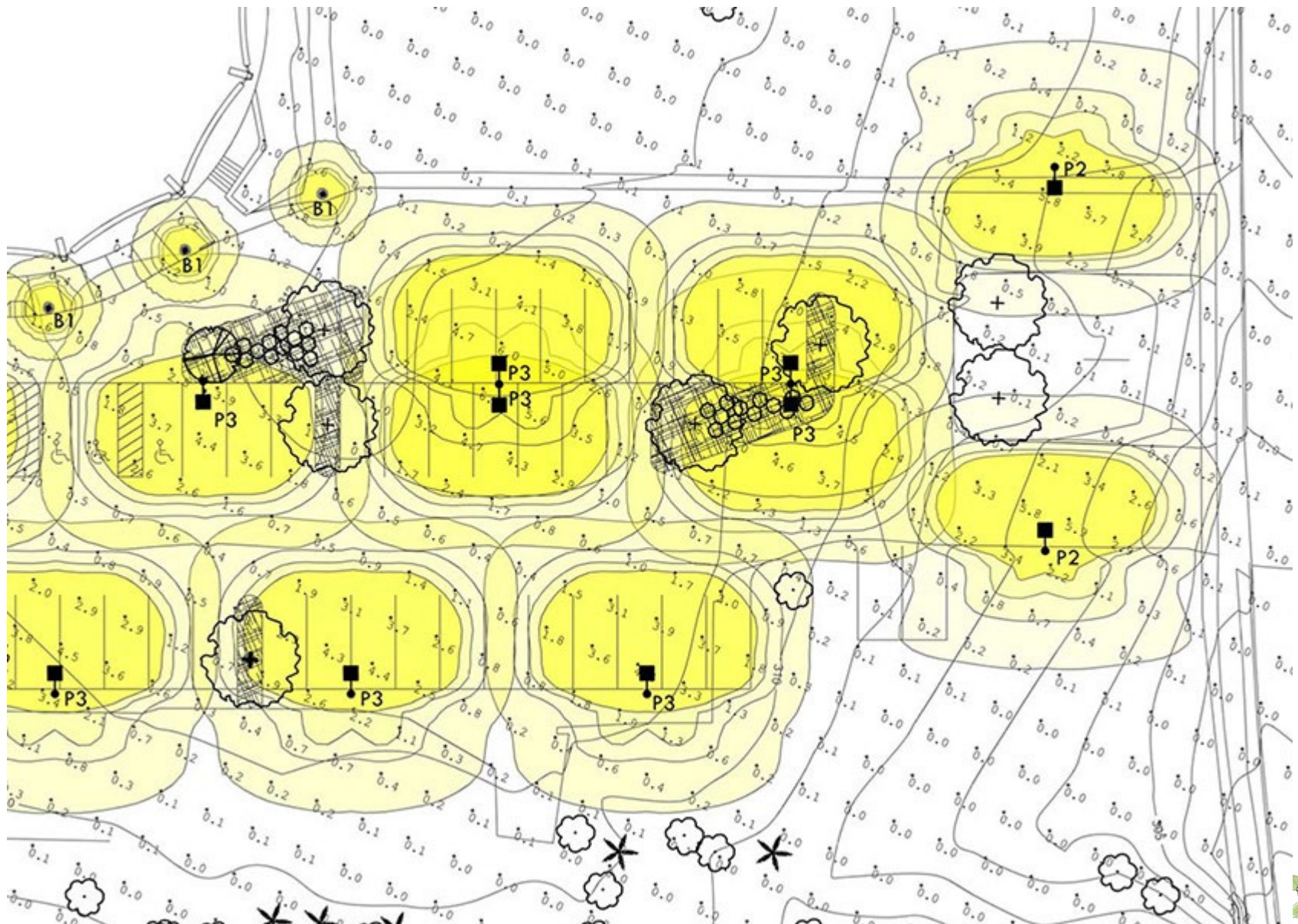


Figure 540-1. Lux and footcandle measurements.



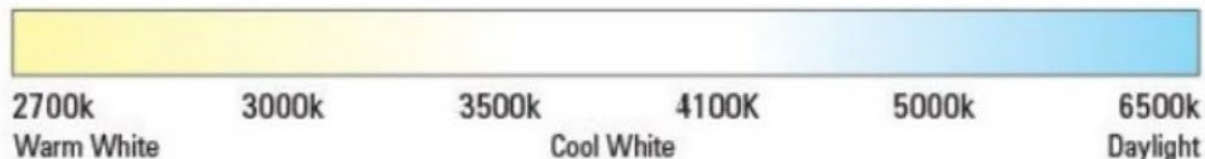
Photometric Plans



Lamp & Fixture Types

	Color Temp (K)	Color Render	Install Cost	Energy Efficiency	Bulb Life
– Mercury Vapor	CWht	Good	Med	Med	Excel
– Metal Halide	CWht	VGd	High	High	Good
– High Pressure Na	Or-Yel	Poor	High	High	Good
– Low Pressure Na	Yel	VPr	High	VHigh	Excel
– Incandescent	WWht	Best	Low	Low	Vlow
– LED	Many	Good	Med	Vhigh	Excellent
– Induction	Many	Good	Med	High	Excellent

Kelvin Scale for Color Temperatures



Illumination Standards

Footcandles

Building Entrances	5.0
Path to Residence	1.0
Parking	1.0
Walkways	0.5
Sports Fields	20-100

CPTED illumination -

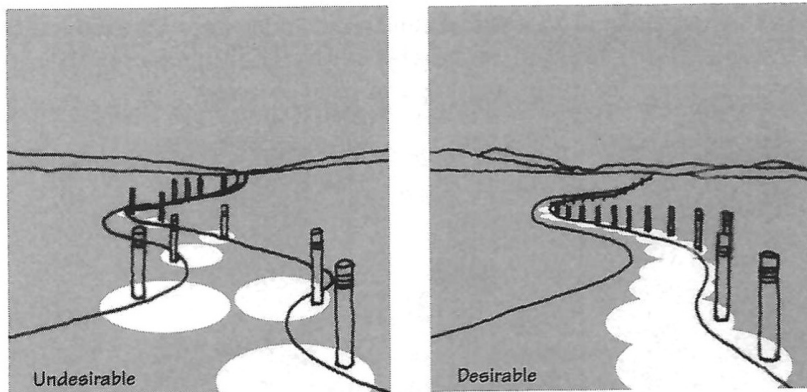
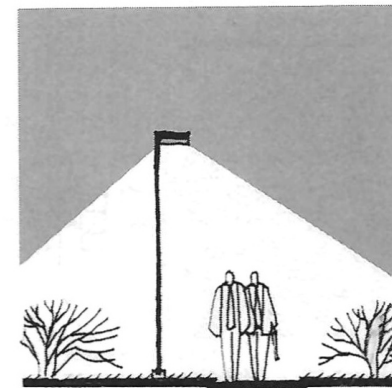


Figure 18.2. Lighting patterns.

Figure 18.3. Walkway lights.



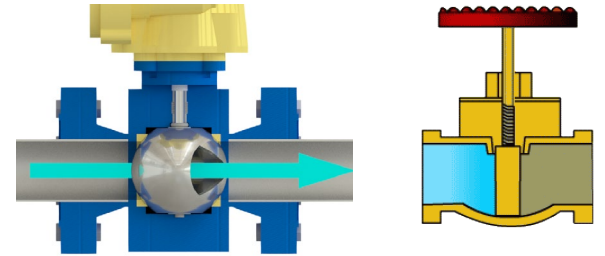
Irrigation Components – At the Street



Water Meter

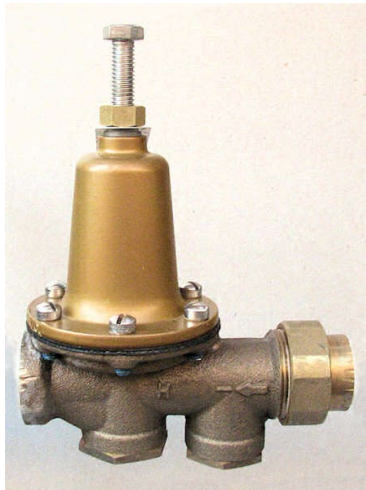


Reduced Pressure
Backflow Preventer



Ball Valve or Gate Valve

Master Valve



Pressure
Reducer



Size
Reducer

Irrigation Components – On Site



ET “Smart” Controller:

- uses real-time data or historical seasonal records to adjust watering times on the fly
- multi-cycle (many short cycles sink in better)



Rain Sensor



Tensiometer (soil moisture)

Irrigation Components – On Site



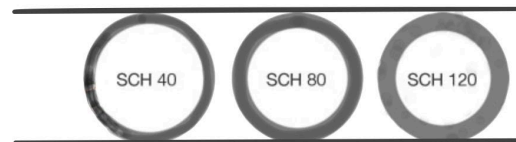
Remote Control Valve



Main Line

- Always under pressure, larger, stronger pipe
- PVC or HDPE pipe (heat weld non-PVC)

Same Outside Diameter



Different Inside Diameter

Lateral Line

- When RCV opens, water enters the lateral lines and comes up to operating pressure
- PVC pipe

Irrigation Components – Spray Systems



Pop Up
Spray Head



Rotor



Impact Sprinkler

Irrigation Components - Drip Systems

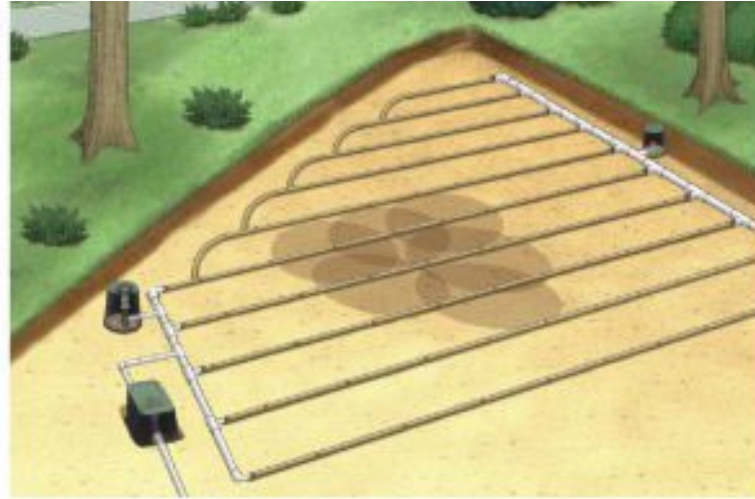


Wye Strainer (for drip)



Pressure Reducer

Subsurface drip arrays



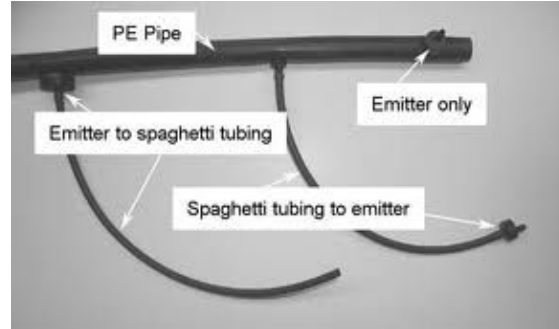
Netafim inline drip tubing (also by other mfcts)

Irrigation Components - Drip Systems

Drip at each plant



Wye Strainer (for drip)



Black Poly Tube, Drip Emitters and/or Laser Line



Pressure Reducer



Fixed Riser

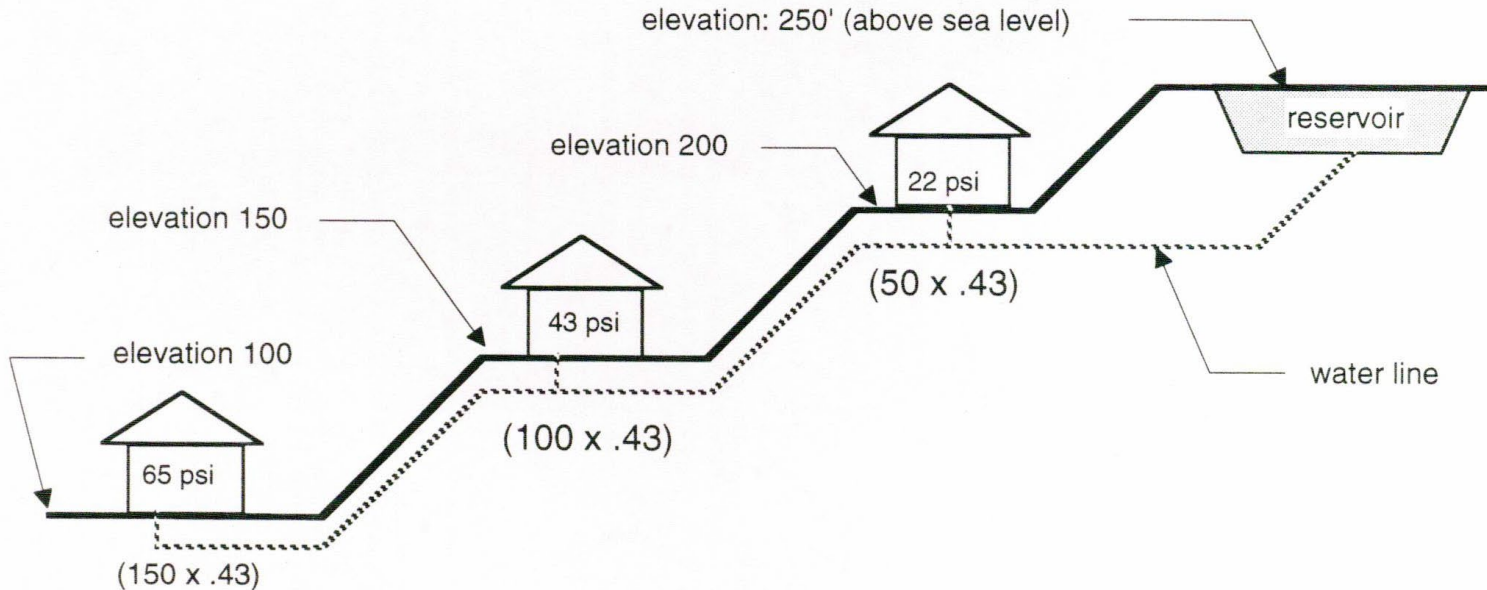


Flex Tubing
Flood Bubblers

Spray vs Drip Systems

Spray Irrigation	Subsurface Drip	Black Poly Drip
	Advantages	
Easier maintenance	Highly efficient/ little waste	Cheap 'n easy
Easier to spot problems	Delivers water directly to plants	Delivers water directly to plants
Less likely to be damaged by animals or weather	Less likely to be damaged by animals or weather	Easier to reconfigure layout
Even coverage is good for tree roots	Deep, even coverage is great for tree roots	Less weed growth
	Disadvantages	
Costlier installation and parts (Supply lines are buried)	Costlier installation and parts (Supply lines are buried)	Parts are cheap but flimsy
Sprayed water subject to wind	Unskilled maintenance may damage hidden lines or emitters	Animals chew on emitters/tubing
Watering ground surface encourages weed growth	Turf areas more difficult to establish	Limited lifespan
	Need a filter to prevent clogging	Need a filter to prevent clogging

Water Pressure Calculation



In Figure F above, each of the houses sits at a different elevation. The pressure at each house will therefore be the difference in elevation between the reservoir and the house in question times .43. The answers are rounded to the nearest psi.

Illustration by Chris Grampp

<http://www.irrigationtutorials.com/>

Jess Stryker

Reduced Pressure Backflow Preventer



Reclaimed/Recycled Water

- Reclaimed or recycled water must be carried in purple color pipe with purple color elements to warn that the water is not safe to ingest.



Playgrounds

ADA access requirements

- Protective surfacing materials
- Clear zones around pieces of equipment
- Child guardrail standards
- Use areas separated by age groups
- Limited access points
- Avoid hazardous landscaping



Engineered Wood Fiber (EWF)

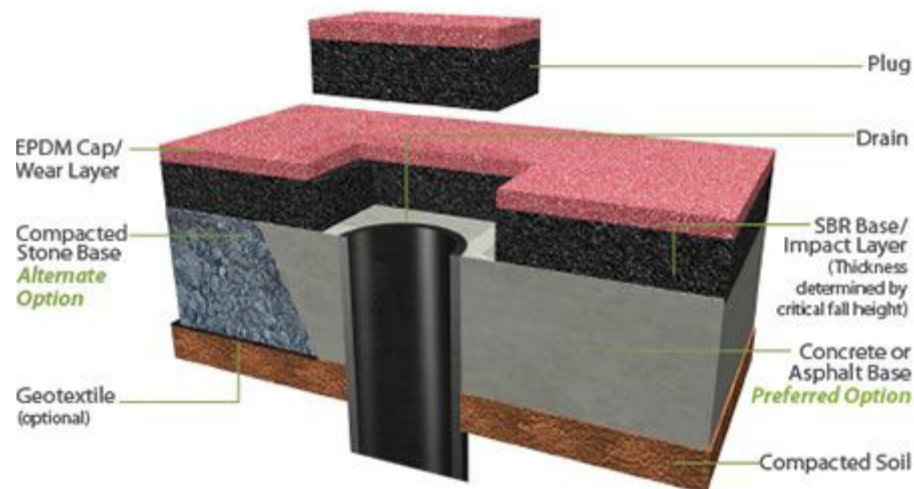
Poured In Place (PIP)
Rubberized Surfacing

USE ZONE

When building your new swing set, you must consider the area or use zone for the swing set. The use zone is the possible area that a child could fall and should be free of other obstacles or equipment.



RUBBER SURFACING
Pour In Place Rubber - Plug Detail



1.8 Develop General Notes, Schedules and Legends

Common Standard Symbols for Plans

	PROPERTY LINE
	CENTERLINE
	PROPOSED CONTOUR
	EXISTING CONTOUR
	SPOT ELEVATION
	HIGH POINT
	LOW POINT
	GRADE BREAK
	TOP OF WALL
	BOTTOM OF WALL
	TOP OF CURB
	BOTTOM OF CURB
	TOP OF STAIRS
	BOTTOM OF STAIRS
	FLOW DIRECTION
	STREAM CENTERLINE
	BENCHMARK
	LIMIT OF WORK
	DIRECTION/PERCENT SLOPE
	FENCE
	STORM DRAIN
	SANITARY SEWER
	WATER LINE
	GAS LINE
	ELECTRIC LINE
	HYDRANT
	VALVE
	UTILITY POLE
	LIGHT

Typically to 1.00' on hardscape and 1.0' on softscape

Drawing Notes

Drawing notes act as short instructions to the Contractor and may also deal with regulatory and permitting issues that are applicable to the project.

Notes act like abbreviated specifications as to items that need to be considered or performed by the Contractor. Some typical subjects covered by drawing notes include:

- Standards and Permit Requirements
- Notification Requirements
- Health and Safety Requirements

LEGEND

	DIAMETER	GA.	GAUGE	REQ'D.	REQUIRED
	AT	GALV.	GALVANIZED	RIM	TOP OF GRATE ELEVATION
	EXISTING SPOT ELEVATION	GL	GALLON	S	SOUTH
	NEW SPOT ELEVATION	GPM	GALLONS PER MINUTE	SCH.	SCHEDULE
	EXISTING CONTOUR	H	HIGH	SD	STORM DRAIN
	NEW CONTOUR	HDPE	HIGH-DENSITY POLYETHYLENE	SHT	SHEET
AB	AGGREGATE BASE	HORIZ.	HORIZONTAL	SIM	SIMILAR
AC	ASPHALTIC CONCRETE	HT.	HEIGHT	SPECS	SPECIFICATIONS
AD	AREA DRAIN	ID	INSIDE DIAMETER	SQ.	SQUARE
ARCH.	ARCHITECT	INCL.	INCLUDING	SS	STAINLESS STEEL
BC	BACK OF CURB	INV.	INVERT	S.S.D.	SEE STRUCTURAL DRAWINGS
BLDG.	BUILDING	JNTS.	JOINTS	T	TELEPHONE
BM	BENCHMARK	L	LONG	TBD	TO BE DETERMINED
BTM.	BOTTOM	LTG	LIMIT OF WORK STREET LIGHTING	TBM	TEMPORARY BENCHMARK
BTWN	BETWEEN	L	LONG	TC	TOP OF CURB
CATV	CABLE TELEVISION	MAX.	MAXIMUM	THK	THICK
CB	CATCH BASIN	MH	MANHOLE	TSP	TEASPOON
CJ	CONSTRUCTION JOINT	MIN.	MINIMUM	TYP	TYPICAL
CL	CENTER LINE	(N)	NEW	UDN	UNLESS OTHERWISE NOTED
CLR	CLEAR	N	NORTH	VERT.	VERTICAL
CONC.	CONCRETE	NCN	NO COMMON NAME	W	WIDE
DI	DRAIN INLET	NIC	NOT IN CONTRACT	W/	WITH
DIAG	DIAGONAL	NTS	NOT TO SCALE	W/O	WITHOUT
DWG	DRAWING	OC	ON CENTER	WM	WATER METER
(E)	EXISTING	OCEW	ON CENTER EACH WAY	WV	WATER VALVE
EA.	EACH	OD	OUTSIDE DIAMETER		MONUMENT
EJ	EXPANSION JOINT	P.A.	PLANTING AREA		DETAIL NUMBER
EL.	ELEVATION	PC	POINT OF CURVATURE		SHEET on which detail appears
ELEC.	ELECTRICAL	PCC	PT. COMPOUND CURVATURE		
ELEV.	ELEVATION	PERF	PERFORATED		
EP	EDGE OF PAVEMENT	PGE	PACIFIC GAS & ELECTRIC		
EX.	EXISTING	PL	PROPERTY LINE		
FG	FINISH GRADE	POB	POINT OF BEGINNING		
FH	FIRE HYDRANT	PROP.	PROPERTY		
FTG.	FOOTING	PT	POINT OF TANGENCY		
		R	RADIUS		

PLANT CALLOUT:

	SPECIES ABBREVIATION
SAL SPA 4	NUMBER IN THIS GROUP
30' O.C. #1	CONTAINER SIZE
	SPACING, IF RELEVANT

1.9 Comply with Code Requirements and Dimensional Standards

In the United States, building is regulated by two major codes. They overlap in confusing ways. Further, the International Building Code has two versions – standard and residential. These standards apply to public places.

	ADA (2010)	IBC (2018)
Riser	<p>Min riser 4", max 7"</p> <p>No limits on number of treads</p> <p>Open risers prohibited</p>	<p>Min 4", max 7"</p> <p>Single risers only allowed for certain occupancies (<u>factories</u>, single family/duplex, storage, barns)</p> <p>Open risers prohibited for public spaces</p> <p>Open risers allowed for private residences</p>
Tread	Min tread 11" (no max)	Min tread 9" (no max)
<u>Nosings</u>	No color contrast required except at escalators	Not required if tread is at least 11"
Handrails	<p>Always required for ramps and stairs on both sides</p> <p>(<u>no</u> matter how many risers)</p>	<p>Required, both sides, for stairs that have two or more risers</p> <p>(for uses allowed to have one stair, no handrail required)</p>
Guardrails	Not part of ADA	<p>Required where <u>dropoff</u> exceeds 30".</p> <p>Guardrails must be 42" high in public places/36" high in private residences and be constructed so a 4" sphere cannot pass through.</p>



Industrial site with open riser stair



Public stair – color contrast nosings, cycle channel



Private residence – single step with no handrails

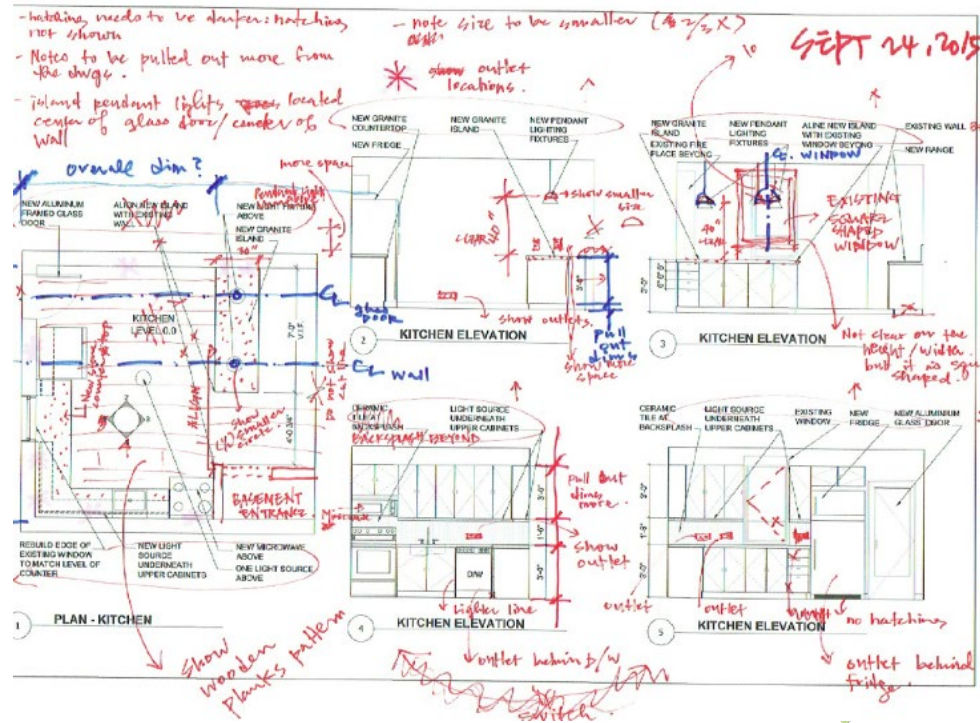
1.10 Perform QA/QC Activities

QAQC is Quality Assurance/Quality Control.

Coordination of a design team is the responsibility of the Project Manager for the Prime Consulting design firm. This firm generally hires subordinate firms to execute drawings and specifications for portions of the project that the prime either is not qualified to execute or does not wish to execute, in the latter case usually for reasons of efficiency.

Coordination will have its own line items in scope and fee proposals and can be as much as 10% of the overall work – it is important and time-consuming. The Prime will check the work of all the firms on the team to ensure coordination and code compliance.

Redlines.



Subdomain 2: Construction Specifications and Bidding

- Develop Project Manual and Front-End Specifications
- Establish Bid Requirements
- Write Technical Specifications
- Facilitate Bid Process (e.g., bid forms, meetings, delivery process)
- Respond to Bidders' Questions and Prepare Addenda

CSI Division 0 and 1 Sections

“Front matter” or “General Conditions” – Divs 0 and 1 contain information about the contract itself and not the project work.

Div 00 – Procurement and Contracting Requirements

This contains the formal project Contract. It is often provided by the Client, especially if you are working for a city or public agency.

Div 01 – General Requirements

011000 Summary of Work

–Description of the work of the project

012900 Payment Procedures

–How work is measured and paid for

013300 Submittal Procedures

–Types and procedures for submittals and their approval

015000 Temporary Facilities

–Power, water, temp. office requirements during construction

017419 Construction Waste Management and Disposal

–Salvaging, recycling and disposing of non-hazardous materials

018113 Sustainable Design Requirements

- LEED etc

What Is Typically in Division 00?

Bidding Requirements

- Advertisement for Bids
- Instructions to Bidders
- Bid Form
- Bid Bond
- Qualifications Statement

Contracting Requirements

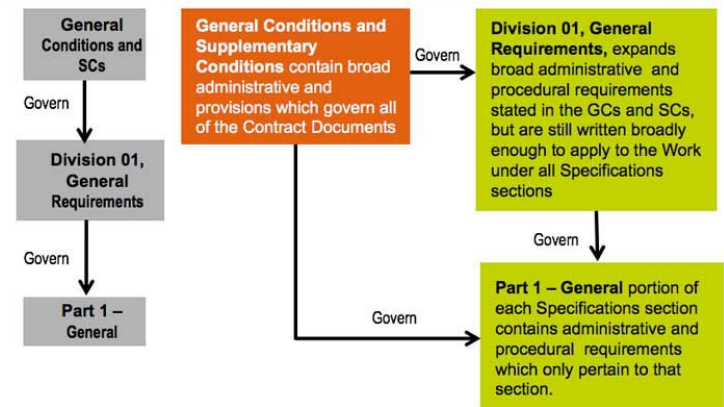
- Owner-Contractor Agreement
- Performance Bond and Payment Bond Forms
- General Conditions
- Supplementary Conditions

...and, not part of Division 00 but to be closely coordinated with it are...

Specifications

- Division 01, General Requirements – *Div 01 is essentially an extension of Div 00*

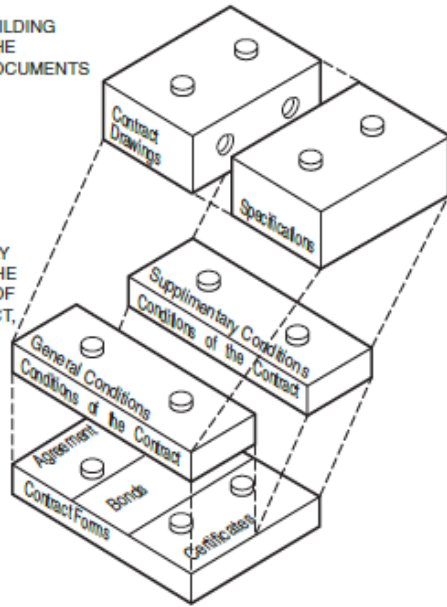
How Divs 00-01 Affect Div 02-49 Specs



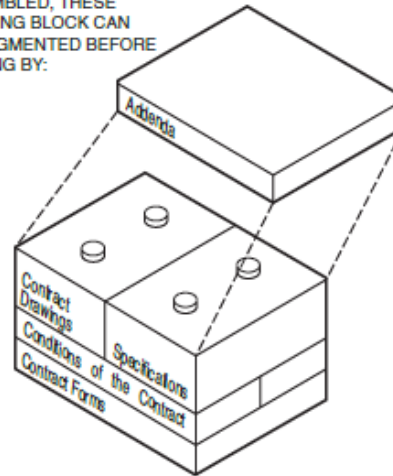
2.2 Establish Bid Requirements

1. THE BASIC BUILDING BLOCKS OF THE CONTRACT DOCUMENTS ARE:

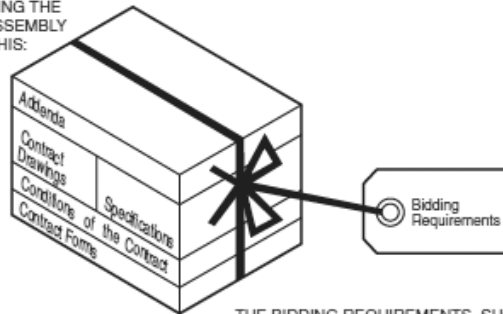
THESE JOINTLY REST UPON THE CONDITIONS OF THE CONTRACT, WHICH ARE FORMED OF:



2. ASSEMBLED, THESE BUILDING BLOCK CAN BE AUGMENTED BEFORE BIDDING BY:



3. BEFORE PRICING THE WORK, THE ASSEMBLY LOOKS LIKE THIS:

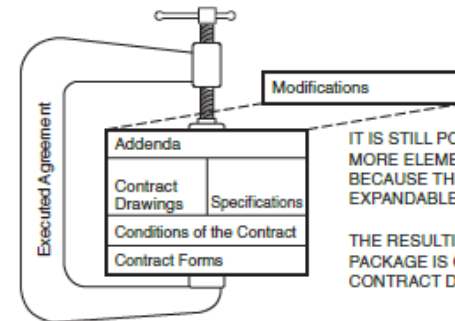


THE BIDDING REQUIREMENTS, SUCH AS INSTRUCTIONS TO BIDDERS AND BID FORMS, TEMPORARILY BIND EVERYTHING TOGETHER AS A PACKAGE FOR PRICING.

THE BIDDING REQUIREMENTS ARE REMOVED WHEN THE AGREEMENT IS EXECUTED.



4. WHEN BIDDING OR NEGOTIATING IS OVER, THE AGREEMENT IS EXECUTED, WHICH BINDS THE DOCUMENTS TOGETHER FIRMLY AND PERMANENTLY.



IT IS STILL POSSIBLE TO ADD ONE MORE ELEMENT, THE MODIFICATIONS, BECAUSE THE AGREEMENT IS EXPANDABLE.

THE RESULTING TIGHTLY BOUND PACKAGE IS CALLED THE CONTRACT DOCUMENTS.

Preparing Bid Packages

Landscape Architects will help Owners prepare Bidding Criteria and Bid Packages. All contractors who wish to bid will be given the same package, accompanied by our Plans and Specifications. These typically include:

- Invitation to Bid
- Instructions to Bidders
- Bid Form
- Bid Bond
- Agreement (Contract)
- Performance Bond
- Payment Bond
- Certificates for Insurance
- Standard General Conditions/Front Matter/Division 0
- Supplemental General Conditions
- Equal Opportunity Requirement and Certifications
- Prevailing Wage Rates for union jobs

2.3 Write Technical Specifications

Prior to 2015, LARE tested the CSI 16 Division model (1995). You can expect to be tested on the current CSI 49 Division model; introduced 2004/updated 2010.

Divisions describe broad categories for types of work.

Within each division are specification **Sections**, which correspond to chapters in a book. Sections deal with specific items of work, such as irrigation.

Within each Section, there are typically 3 **Parts**:

Part 1: General

- Scope of Work
- Submittals
- Reference Standards

Part 2: Products

- Materials

Part 3: Execution

- Installation Standards
- Finishes

Sections Commonly Written by LAs

SECTION 32 91 13

PLANTING SOIL: AMENDED SITE SOIL

PART 1. GENERAL

1.1 SECTION INCLUDES

Planting Soil to be produced from Site Soil, stockpiled, tested and amended prior to final placement in planting areas. After placement, final testing and inspection with Landscape Architect is required prior to planting as described below.

Remove and stockpile topsoil from site adequate to provide 18" depth of Planting Soil throughout planting beds after amendments have been mixed into stockpiled soil. Site soils to be screened by General Contractor to remove rocks and debris prior to commencement of stockpiling, testing, amending and final site placement by Landscape Contractor.

Landscape Contractor shall furnish and provide all labor, materials, supplies, tools and transportation, and perform all operations in connection with and reasonably incidental to site preparation and other operations designed to test, amend, and place stockpiled Planting Soil. If additional Planting Soil is required, proceed under the conditions given in Section 32 91 14, Planting Soil: Imported Soil.

1.2 RELATED SECTIONS

Consult all other sections to determine the extent and character of the work specified elsewhere but related to that included in this section. Work specified herein shall be properly coordinated with that specified.

- A. Earthwork Section 31 20 00.
- B. Sewage and Drainage Systems Section 33 41 00.
- C. Planting: Trees, Shrubs and Ground Covers Section 32 93 00.
- D. Landscape Maintenance Section 32 01 90.
- E. Planting Soil: Imported Soil 32 91 14
- F. Irrigation System: Section 32 84 00

1.3 REFERENCES

General

Requirements of the General Conditions, Supplementary Conditions and Division 1 apply to the work of this Section.

AOS

American Organic Standards.

129300 Site Furnishings

221423 Storm Drainage

311000 Site Clearing

312000 Earth Moving

321216 Asphalt Paving

321313 Concrete Paving

328400 Irrigation

329300 Planting

2.4 Facilitate Bid Process

BIDDING

- Invitation to Bid – publicly advertised or sent to short list of qualified contractors
- Pre-Bid Meeting (can be mandatory or optional)
- Design Team: Receive Questions and Issue Addenda or Clarifications
- Design Team/Owner: Evaluate Bids and Award Contract

CONTRACT IS EXECUTED AND CONTRACTOR POSTS BONDS

CONSTRUCTION

- Pre-Construction/Kickoff Meeting
- Work begins. Contractor occupies the site and assumes responsibility for security.
- Contractors: Issue RFIs → Design Team: Issue ASIs (Architects' Supplemental Instruction)
If these result in cost or scheduling changes, → Contractor prepares a Change Order, → Design Team reviews, Client approves and → the Construction Contract is amended
- Contractors: Notify Design Team and Owner when the site is ready for inspections required in the Contract Documents.
- Design Team: If minor items are noticed on these Inspections, issue Field Order (no change to cost or scheduling) or work with Contractor and Owner to issue an ASI → Change Order.
- Contractors: Notify Building Inspectors when the site is ready for their inspections. Building Inspectors: Document whether work meets codes or needs correction.
- Contractors: Notify Owner/Design Team when the project is ready for the Punch/Substantial Completion Walk. Team reviews Punch List (minor tasks that remain) and asks for additional work or approves.

OWNER/DESIGN TEAM APPROVE SUBSTANTIAL COMPLETION

MAINTENANCE PERIOD

- Owner is able to occupy the site and assumes responsibility for security.
- Maintenance Period (30 day, 90 day, etc) was defined in the initial Bid Set and included in the price. Installing Contractor replaces plants that fail, maintains irrigation, cleans hardscape, mows turf, and keeps project in 'a thriving condition' within the budget they included in their bid.
- At end of Maintenance Period, Owner and Contractor walk the site and if all is well, Contractor is released from the contract and final closeout/payments are made.

Preparing the Bid Form

Here is a simple Bid Form for a private residential project.

Note the sections for Base Bid, Allowances, and Bid Alternates.

FINAL

Contractor Name: _____

BID FORM

1. PROJECT: _____ Project # _____
Prepared by: _____ Dated: _____

 2. The undersigned being familiar with the local conditions affecting the cost of the work, and with the Plans and Specifications, Invitation to Bid, Instructions to Bidders, Bid Form, General Conditions, hereby proposes to furnish all material, labor, tools, equipment and incidentals necessary to perform the work in accordance with the Plans and Specifications for the above stated project, including Addenda numbers (1) _____ Date: _____, (2) _____ Date: _____, (3) _____ Date: _____.

 3. BASE BID (including allowances) \$ _____

- Numerical Text*
4. ALLOWANCES (ALL ALLOWANCES LISTED ARE INCLUDED AS PART OF THE BASE BID)
 1. _____
 2. _____
 3. _____

 5. ALTERNATES
 - Alternate #1 _____
_____ Add/deduct \$ _____
 - Alternate #2 _____
_____ Add/deduct \$ _____
 - Alternate #3 _____
_____ Add/deduct \$ _____

 6. UNIT PRICES FOR ADDITIONS/DEDUCTIONS:
 - #1 _____
_____ Add/deduct \$ _____

2.5 Respond to Bidders Questions and Prepare Addenda

- During the bid period, contractors can ask questions about the plans or project.
- The design team tabulates the questions.
- The answers are issued to all bidders so they all have the same information.
- If an answer requires additional specifications or drawings, it is issued in a formal package called an Addenda package. These are numbered and kept in careful order.
- The Contractors will need to assert that they have received all the Addenda when they submit the final bid.

Prepare Bid Comparisons

Compartment Apartments - Bid Comparisons					
Item	LandScape	Irritropicalia	Macarena	Greenjeans	Averages
Bid Total	\$1,426,304.00	\$1,223,805.00	\$1,352,996.00	\$1,453,469.28	\$1,364,143.57
(Sum)	\$1,426,304.00	\$1,223,805.00	\$1,352,996.00	\$1,453,265.03	
1 Permits					\$5,000.00
2 Hardscape	\$366,867.00	\$351,154.00	\$391,121.25	\$476,121.73	
3 Planting and Irrig	\$374,346.00	\$200,571.00	\$247,681.00	\$291,365.43	
4 Tree protection	\$16,874.00	\$35,615.00		\$7,000.00	
5 Pool and Spa	\$546,146.00	\$525,105.00	\$297,211.00	\$269,283.50	
7 Plumbing			\$32,686.25	\$4,795.75	
8 Electrical			\$97,437.50	\$193,617.23	
9 Deck		\$19,440.00		\$48,410.37	
10 Fence	\$122,071.00	\$91,920.00	\$120,625.00	\$141,659.34	
11 Site Furnishings			\$166,234.00	\$21,011.68	
Sares Regis					
12 supervision fee: 5%	\$71,315.20	\$61,190.25	\$67,649.80	\$72,673.46	
Grand Total:	\$1,497,619.20	\$1,284,995.25	\$1,420,645.80	\$1,525,938.49	\$1,432,299.69
NOTES:				Steel heading included here in Item 3. Spreadsheet items add up to \$1,458,265.03	
EXCLUDED:	Fees and Permits will be a CO	Permits, testing, and inspection cost.	Fees and permits? Clarify	Site furnishings not broken out as a separate item - confirm they are included	
	Costs & Work Arising From 'Acts Of God'	Existing Tree Removal	Utility damage		
	Damages & Penalties For Delays	Steel Headers			
	Unforeseen / Concealed Site Conditions	Bonds			
	Overtime / Off-Hours Work	Pedestrian and traffic control			

Subdomain 3: Construction Administration (30%)

- Conduct Pre-Construction Activities (e.g., walkthrough, meetings)
- Respond to RFIs
- Manage Construction Contract (e.g., budget items, change orders, bulletins, purchase requests, change directives)
- Review Submittals (e.g., shop drawings, materials submittal, product submittals, substitutions, mock-ups)
- Conduct Site Observations and Field Reports
- Perform Project Close-Out (e.g., punch-list, substantial completion, guarantee period, final completion)
- Perform Construction Project Management (e.g., roles and responsibilities, liabilities, scope, schedule, coordination with other disciplines, coordination with owner)

3.1 Conduct Pre-Construction Activities

(eg walk through, meetings)

The Prime Consultant will assist the Owner with finalizing the Construction Contract. Key responsibilities:

Key Duties and Responsibilities of the Landscape Architect

- Must be thoroughly familiar with the Contract Documents.
- Conducts the Pre-Construction Conference.
- Actions should be oriented toward minimizing construction delays.
- Ensures compliance with the Contract Documents during construction.
- Reviews the Contractor's Schedule, work in progress or completed work.
- Is responsible for interpretation, modification or correction of the Contract Documents, including shop drawing development.
- Authorizes payments to the Contractor by verifying milestones of completion.
- Keeps the Owner informed of project status.
- Rules on the quality or acceptability of materials, quality of workmanship, progress of the work, and whether the Contract has been fulfilled in an acceptable manner.
- Identify potential or real problems and notify the Contractor and Owner ASAP.
- Does not supervise or assert control over the means, methods, techniques, sequence or procedures of construction.
- Should review and inspect work as it is being put into place...not after.

3.2 Respond to RFIs

A Request for Information (RFI) is a document submitted by the General Contractor to the Prime Designer requesting guidance.

The Prime Contractor will have a standardized form with date, responsible parties, etc. RFIs are tracked, usually with a sequential numbering system.

It is the responsibility of the Prime Contractor to keep a log of RFIs and push for resolution of unanswered items.

Construction phases depend on the swift transmission of information and decisions to keep the project on track – on schedule and on budget.

It is our duty to respond to RFIs as quickly as possible, while striving to understand the issue that is being asked about and provide a solid, complete and workable solution.

ASI (Architects Supplemental Instruction): An order issued by a design consultant based on (usually) a field observation

Change Order: A significant change to the Contract Documents during construction that may change the scope of work, time to complete the work, or the contract price. Work requiring a change order should not be performed until after the paperwork is completed and a price agreed by the Contractor and Owner.

3.3 Manage Construction Contract

(e.g. budget items, change orders, bulletins, purchase requests, change directives)

A Bulletin is a way of providing regular updates and organizing different types of instructions that are issued from the Design Team to the Contractor during construction. **Note that these procedures will all be defined in the Specifications in Divisions 0 and 1 before construction begins.**

So something unexpected has been discovered on the site. What happens in order?

Contractor asks for direction in a Request for Information (RFI).

Design team studies the question. They have several options for responding:

- **Design team can request additional information** -shop drawings, alternative products, a site walk
- **Design team can issue an advisory** that resolves the problem but will not result in changes to the contract
- **Design team can go ahead and issue a revision to the plans or specs** that will result in a change to the contract (cost or schedule), along with a **Proposal Request (PR)** to the Contractor

Contractor prepares a Change Order Proposal (CPO) – to estimate changes in cost or time

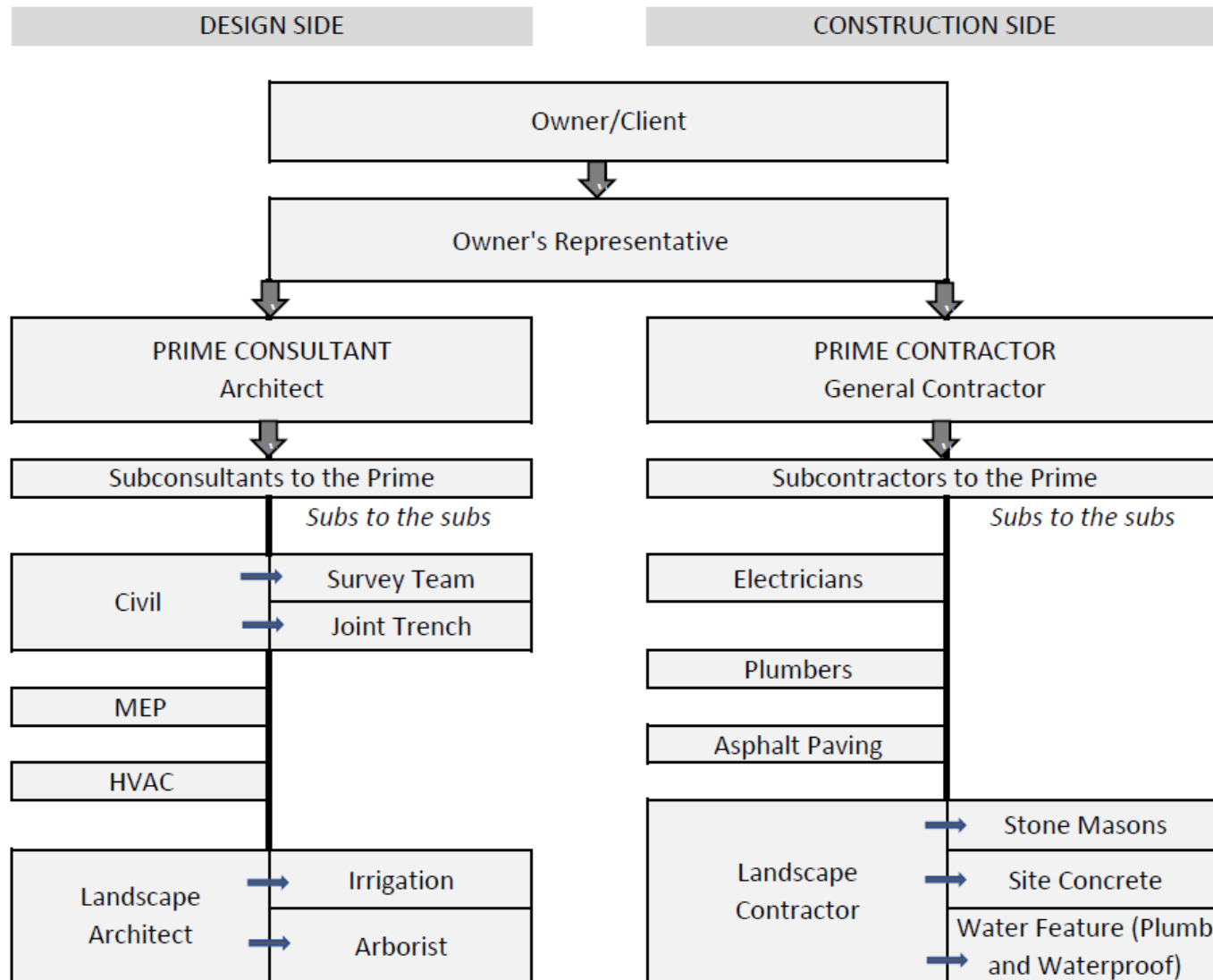
Design team reviews with Owner. If the changes proposed are acceptable, they will authorize the Change

Contractor prepares the formal Change Order. It is signed by Owner, Contractor, and Landscape Architect.

The Contractor proceeds with the Work.

If a plan sheet is revised or added, it is generally reissued (along with any other sheets that have changed) with a delta, a revision cloud, and an issue date

Hierarchy of communication



* Arrows indicate flow of responsibility/direction through the hierarchy.

3.4 Review submittals



Tech Spec

5000 Series Rotors

5000, Plus, PRS, SAM

Built from top to bottom with the contractor in mind, the Rain Bird 5000 Series product line is the durable, reliable rotor for residential and commercial applications. Its Rain Curtain™ Nozzle set includes 12 nozzles: 8 standard angle nozzles and 4 low angle nozzles that ensure you always have the right nozzle in hand for the project.

Standard Features

- Thicker rubber cover
- Self Flushing Arc Adjustment Port: as the riser stem pops-up and retracts a jet of water cleans out the arc adjustment slot
- Slip Clutch: quickly set the left edge of the 5004 rotor (dry set only)
- Self-Flushing tapered stem design and integrated triple-blade multi-function wiper seal protect internals from debris
- Positive riser stem retraction
- Heavy duty case
- 40- 360° arc rotation and reversing full circle rotation in one. (A non-reversing full circle only unit is also available)
- Top-adjust arc adjustment requiring only a flat-blade screwdriver
- Tree of nozzles including 8 Rain Curtain (25° trajectory) and 4 low angle (10° trajectory) provides 25' to 50' (7.6 to 15.2m) distance of throw
- Rain Curtain™ nozzles feature:
 - Large droplets for superior wind resistance
 - Effective close-in watering
 - Even distribution over the entire radius
- Optional pre-installed Rain Curtain™ nozzles
- Optional Matched Precipitation Rate (MPR) nozzles
- Optimized for mid-distance residential and light commercial applications
- True 4" (10 cm) pop-up (measured from the case cover to the nozzle)
- Five-year trade warranty

Operating Range

- Precipitation rate: 0.20 to 1.01 inches per hour (5 to 26 mm/h)
- Radius: 25' to 50' (7.6 to 15.2 m)
- Radius may be reduced up to 25% with radius reduction screw
- Pressure: 25 to 65 psi (1.7 to 4.5 bar)
- Flow Rate: 0.76 to 9.63 gpm (3.0 to 36.6 l/m)

Specifications

- 3/4" (20/27) NPT female bottom threaded inlet
- Reversing full and part-circle adjustment 40° - 360°
- Full-circle only adjustment 360°

Dimensions

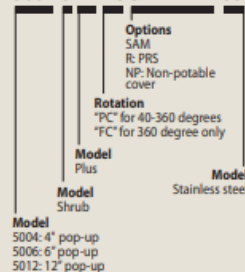
- Pop-up height: Shrub; 4" (10.2 cm); 6" (15.2 cm); 12" (30.5 cm)
- Overall body height: Shrub: 7 3/4" (19.7cm); 4": 7 3/8" (18.5 cm); 6": 9 5/8" (24.5 cm); 12": 16 7/8" (42.9 cm)
- Exposed surface diameter: 1 5/8" (4.1 cm)

Note: Pop-up height measured from the cover to the nozzle. Overall body height is measured popped down



How To Specify

5004-S- + -PC-SAM-R-NP-SS



Note: Certain specifications not available for some rotor series.

- Submittal packages are generated by contractors and subcontractors who will be doing the work, and may include:
- Product cut sheets with technical qualifications
- Color or material physical samples
- Testing results for soil or other elements

3.5 Conduct Site Observations and Field Reports

The design team will make regular site visits to observe the progress of the work and answer informal questions.

If documentation is needed, the design team will issue a Field Report that may include the date, who was there, what condition was observed, what decision was made, and documentation like photographs.

If followup action is required, it may turn into an RFI.

Construction Quality Control

Concrete is mixed at a plant and delivered in special mixing trucks. Generally, concrete should be poured within 90 minutes of adding water.



Slump tests are performed when wet concrete is delivered to the construction site.

Compaction Testing

4.5 kg (10 lb) hammer
25 blows
per layer

Compactive
effort 76 265 Nm
(56,250 ft-lbs)

18"

Soil
sample
0,001 m³
(0.03 ft³)
5 layers

Compaction is measured by the Standard Proctor Test or the Modified Proctor Test (ASTM D-1557)



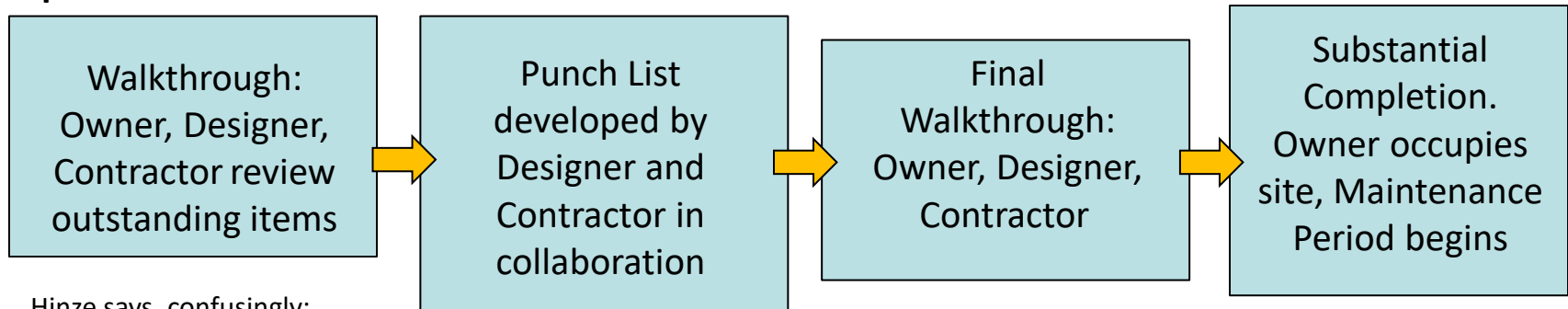
3.6 Perform Project Close-out

(e.g. punch list, substantial completion, guarantee period, final completion)

Punch List:

A document prepared by the Contractor after the final inspection once the Contractor has notified the Designer that he has completed the work. The Punch List is a list of corrections, usually fairly minor, which must be completed before the Designer will authorize release of the Retainage and the Owner will accept the work from the Contractor. The Designer and/or Owner's Rep must verify that the items on the Punch List have been completed prior to authorizing the final payment to the Contractor.

Sequence of events:



Hinze says, confusingly:

(p 244):

These minor work items are typically documented by the owner's representative and distributed to the general contractor and the subcontractors. This documentation of minor deficiencies of the project is commonly called the *punch list*.

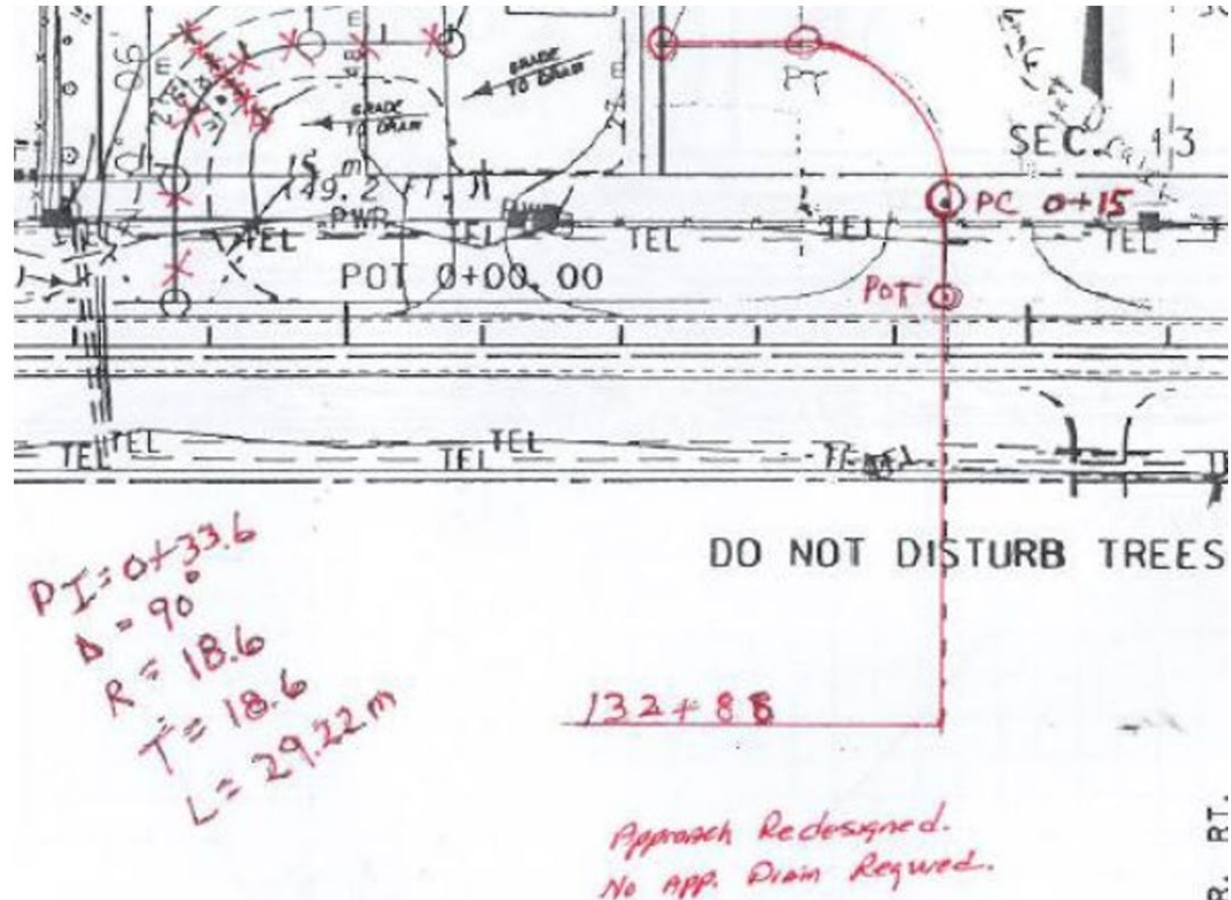
(p 254):

When the contractor has essentially completed the construction work, a formal request is made to the architect for an inspection. Conducting such an inspection is referred to as punch listing a project. A *punch list* is a list of items that must be corrected before the project is acceptable to the owner. The final punch list is normally developed on a joint job visit conducted by the contractor and the architect/engineer.

As Built or Record Drawings

Created by the Designer or Contractor

- Based on detailed notes of changes made during construction
- Records actual installed locations of hidden features like irrigation lines
- Records actual installed locations of critical features like utility boxes



How to Study

ORGANIZE YOUR STUDY TIME

It is best to set up a regular study schedule. Many short sessions are better than a few cram sessions. Can you devote 2-3 hours a week to study, in 30-60 min segments? Block this time out on your calendar and make it realistic given your work and family commitments.

Figure out how many weeks you have and assign a topic or two to each week. Make a study plan.

Each session:

- Start with something easy and pleasant – 5-10 minutes of flashcards is a good beginning.
- 30-40 minutes of reading – review CLARB’s reference books first and then our additional recommendations. Skim for graphics and vocabulary if you have a hard time focusing on reading. Try to understand concepts rather than memorizing numbers or formulas (other than the ones we’ve reviewed today).
- 10 minutes of practice exams

Do you have exam anxiety?

We highly recommend some regular mindfulness practice to defuse the emotional charge around this upcoming event. I have been experimenting with the online course ‘Waking Up’ but also can recommend free lectures by Tara Brach available online. Regular exercise, relaxing with your family or pets, or forest bathing may work too. Be kind to yourself and find ways to enjoy this part of your life while you are doing the work. <3

Turbocharge your effort by forming a Study Group!

A study group needs to be organized just like any project team. Someone needs to take the lead, but there are many online resources that can make this easier. We've set up a Google Sheet to organize this group's contact information. Try to find a few people whose experience is different than yours, by region or by specialization.

- It is often easiest to divide into groups by time zone.
- Schedule regular meeting times. It's okay if you can't make every session but commit to a regular time and set up a calendar invitation so that you won't let it slide to the bottom of your to-do list.
- For each meeting, it works well to divide your time into two or three parts. Maybe start with a review of a reference document, and then move on to doing practice tests. Don't worry about perfection.
- Divide up time-consuming tasks like reading reference books. Take turns summarizing what you think is most important from the books on CLARBs and our list.
- Do practice exams before you meet, review them together and talk about what makes an answer right or wrong. You will learn a lot by just talking about practice questions – especially AIT questions.
- Use CLARB's online Demonstration Exam tools to do calculations and make notes during your practice sessions. Can you build comfort and speed using these tools before test day? Share tips and tricks.
- Write practice questions for each other, especially if you struggle with being able to see what the purpose of a question is. Questions usually have one correct answer and several 'distractors' that are not quite correct. How would you write a fair but difficult question?
- Some study groups make summary sheets or flashcard decks. I have heard that the process of doing this for yourself is more valuable than just using one someone else has made. Make use of Quizlet or Anki.
- Provide each other with positivity and support. Follow up after test day and encourage each other.
- After test day you may find that your study cohorts become long-term friends and resources. I did. Don't be afraid to stay in touch and ask each other technical questions as you continue on with your career.