

INTERPRETING CONSTRUCTION DOCUMENTS

Introductory Level

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Blueprints are the basic element of communication in the construction industry. They are named “blueprints” due to past history when the original tracings were hung in the windows in order to transfer the image to a photo light-sensitive sheet. The use of blue inks was an easy color to receive the transfer, thus the name stuck.

Prints are initially viewed as nothing more than a bunch of confusing lines and symbols. The initial view of any set of drawings is that of a mess – not creating a comprehensive building outline for construction. This view is likely due to a lack of understanding of construction drawings.

The key to properly interpreting construction drawings lies in understanding the basic framework of a full set of drawings. Once a person can get past the initial apprehension of looking at the drawings, the meaning should become clear. It is not a big secret form of communication – it just looks that way.

It is hoped that this introductory course will serve to eliminate the confusion and frustration a person finds themselves in while reviewing construction documents.

It should be noted that the views and methods presented in this course are entirely those of the author/presenter. These views and methods should not be misconstrued as industry standards. (They should be but aren't yet).

A proper set of construction documents is made up of two equally important and linked elements:

Specifications And Drawings

Neither element can be reviewed independently of the other. By the end of these two nights, I am hoping that you will agree with this statement.

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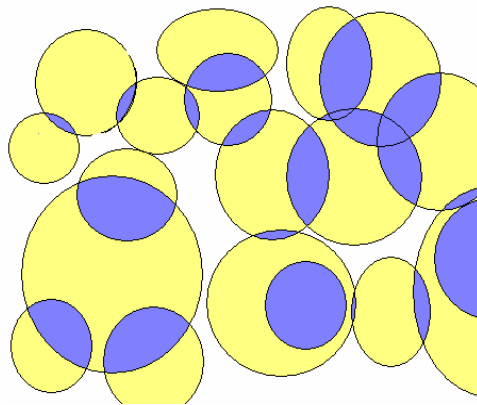
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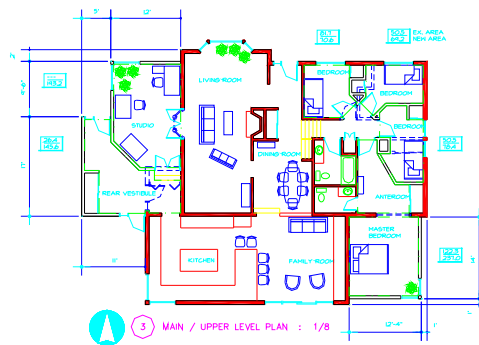
INTRODUCTION AND BACKGROUND

The basic process of construction is a team effort from the consultants (Architects, Engineers), the Owners, working alongside the Contractors. It should not be an adversarial relationship. The process of teamwork is required in order to produce a superior product that everyone can use for future reference. Our reputations, as well as yours, are based on our last mistakes.

The task of interpreting the construction documents is fairly immense. It isn't easy when you haven't been involved in the process to look at something which resembles this:



and realize that the Architect actually intends the final built product to look like this:



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The design process leading up to construction documents can take years to complete, requiring different schemes and sketches. Some of these preliminaries can get quite intensive and detailed, going through 10 – 20 different variations.

I won't attempt to explain the actual design process since an explanation of that type is not required in order to understand the physical reality of construction documents.

The construction documents that are produced for the building process represent hundreds of hours of work, involving dozens of people and different offices, and represent hundreds of decisions along the way.

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1. The purpose of blueprints

- Instrument of communication
- Ideas on paper
- details the elements of construction
- communicate the idea to the builder
- show resolved details of construction
 - we are supposed to know how to build
- detail all areas of construction wither in visual or verbal form
 - {no wiring to be surface applied, what type is used and where allowed}
- we don't always say why it must be done that way but there will be a reason
 - { drying chamber uses plastic paint but will look just like a storage room}
- construction documents should be complete to the best of our abilities in order to get an accurate, fair and reasonable price, and facilitate a smooth construction process.
- If I've done a good job, you can too.
- If the information cannot be found on either the drawings or specifications, then you cannot make an assumption as to the desired result.
- ASSUME is a dirty word in our industry. If you assume, you have a 50 percent chance of being wrong. If you are wrong, you may have to change it. It all comes down to responsibility, if you make the decision without being granted the right to do so, you are automatically accepting the responsibility for it and all the ramifications resulting from that decision are now yours. In the end, it may cost you time and money. Don't assume.
- Always ask the question – do it in writing, leave the decisions to those responsible for them, limit your liability



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Drawings may include:

- Site Plan
- Floor Plans
- Reflected Ceiling Plans
- Elevations
- Building Sections
- Wall Sections
- Door, Window, Building Details
- Finish Schedules, Door Schedules, Window Schedules
- Interior Elevations
- Millwork / Miscellaneous Details

Specifications include:

- General Contractual Conditions
- Supplementary General Conditions (Specific to the Actual Project)
- Individual Specification Sections for all Materials and Installations
- Finish Schedules, Door Schedules, Window Schedules.

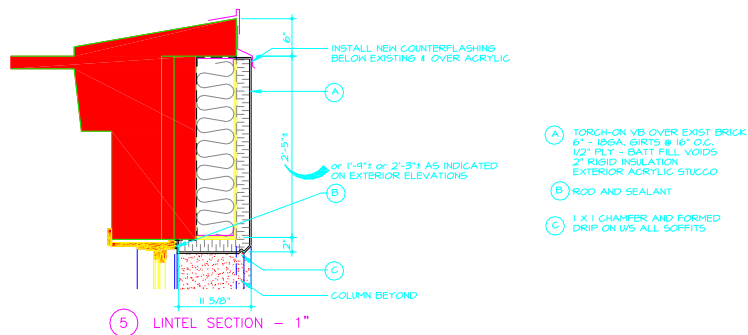
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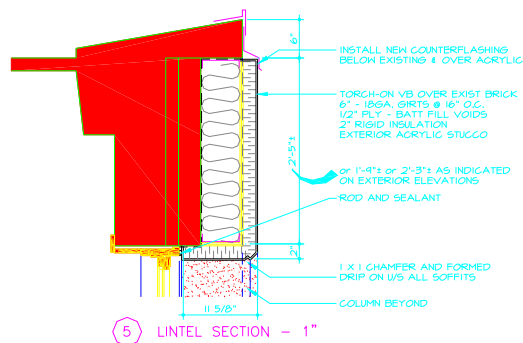
There are several drawing type formats as well as specification formats. Each consultant has the opportunity to select a type that they feel will work best for the particular project. Typically, offices have developed standards that they like to use making them cost-effective and efficient.

Basic drawing types are known as

Key Notes : The first example is a key note drawing. This method sets the material descriptions aside and numerically references them into the wall section. It allows for typical assemblies to be listed as well as for additional materials to be added without much complication. This method requires constant referencing back to the note legend until one learns all the numeric references.



Descriptive Method : The second example is a descriptive drawing. This method illustrates and calls up the materials within each detail. Typically, there is a standard detail on the sheet for the basic component systems and additional details are referred back to it. This method is detail specific however it doesn't take to changes within the systems well.



The basic difference between these two is only in how you will find the information. All of the information is the same and included on the drawings, it's just located or referenced in a different manner.

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Specifications also have variations on their formats.

- descriptive
- generic / global

Descriptive specs will tell you what to use by name, how to install it and where.

Generic specifications will not list any product by name, nor give a clear direction to its use. This type is common to the National Master Spec where they are attempting to not "favor" any one product – rather they spec what is intended towards the product type, quality, standards and reference methods.

Drawings are the visual method by which we show the construction. Drawings are interpretive and subject to each person's own bias.

Specifications are the verbal method by which we describe the construction. Specifications are not nearly as interpretive as drawings, since they are specific and direct.

Everything shown on the drawings will be noted in the specifications.

- earth moving
- ceiling tile
- paint
- accessories.

Specs may contain items not shown on the drawings that can impact your schedule, costs, and or work

- time frames
- sequencing
- cash sums
- additional materials
- switches
- totes, etc.

The written language has precedence over drawings because lawyers and judges can't read drawings. They deal in the written text. A drawing can be subject to interpretation whereas the typed word must be clear and specific.

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2. Integration of Specs & Prints

- How are the two items linked.
- Order of precedence
- Liability of errors and omissions
- Drawings and Specs make up the contract. You cannot have one without the other in some form.

- smaller projects will have the spec right on the drawings, some other types may have the drawings contained within the specs.

- don't ever assume that what you have is all inclusive without checking.

3. Interpreting the Written Language

- Construction terms
- Abbreviations and Acronyms

4. Drawings Scales

- Purpose of different scales
- Large vs Small Scale drawings

5. Element Identification

- Lineweight
- Linetype
- Hatching
- Key Notes
- Order of Precedence

6. Schedules and Symbols

- Purpose of Schedules
- Symbol interpretation
- Cross-referencing

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7. **Site / Location Plans**
 - Surveys
 - Landscaping
 - Plot Plans
8. **Foundation Plans**
 - Foundation members
 - Foundation Types
 - Reading Plans
9. **Floor Plans**
 - Building Layout
 - Interior Organizations
 - Dimensions / Symbols
 - Schedules
10. **Reflected Ceiling Plans**
 - Purpose
 - Elevations
 - Details
11. **Exterior Elevations**
 - Material Designations
 - Finishes
 - Projections Orientation
12. **Building Sections**
 - Purpose
 - Building Relationship
 - Material Assembly
13. **Wall Sections**
 - Large Scale Details
 - Overall Sections
 - Dimensions
 - Orientation/Cross Referencing
 - Materials
14. **Detail Drawings**
 - Purpose
 - Cross-References
 - Interpretation

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- 15. Interior Elevations**
 - Orientation
 - Finishes
 - Fitments
- 16. Millwork**
 - Orientation
 - Cross-references
- 17. Structural**
 - Foundation
 - Wall Sections
 - Roof Framing
- 18. Mechanical Drawings**
 - Site Services
 - Plumbing
 - Ventilation
 - Fire Suppression
- 19. Electrical Drawings**
 - Site Services
 - Lighting
 - Building services
 - Schedules and Schematics
- 20. Specifications**
 - General Conditions
 - Supplementary General Conditions
 - Specific Sections
- 21. Total Contract Documents**
 - Overall Comprehension
 - Specifications/ Addenda
 - Drawings
 - Order of precedence
 - Co-ordination
- 22. Legal Issues**
 - Building Codes
 - Authorities Having Jurisdiction
 - Bidding Procedures
 - Contracts

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Building codes and published regulations are sets of safety regulations with respect to structure requirements, fire issues, and public health & safety. These governing rules were developed in response to frequently demonstrated hazards of structural collapse, catastrophic fires, and spread of disease. They were not, as is assumed in many cases, created to limit the abilities of the designer, make life complicated on site, and give the authorities something to fall back on.

The actual process of building design and construction creates the greatest set of compromises with which man is faced. The best idea may need modification in order to meet the prescribed regulations of codes and local bylaws. These regulations ensure a level of conformity in all buildings for the protection of the general public and owner.

Fire and Design of Buildings

Fire presents a major hazard to life and property in buildings. The requirements of building codes refer to creation of fire compartments which are used to confine property loss to the compartment where it originated. The same philosophy is used when it applies to life safety.

Fire resistance is defined in terms of the length of time it will meet certain requirements when exposed in a test furnace. Codes regulate the allowable size of a compartment or building without having any special forms of construction such as firewalls or fire suppression systems such as automatic sprinklers. Sprinklers allow for larger compartments due to the ability to quickly contain a hazardous situation..

Stairwells, ventilating shafts, refuge areas in tall buildings and areas where identified hazards are present (boiler rooms, janitor rooms, electrical rooms) should constitute totally enclosed fire resisting compartments due to the nature of the zone. This regulation is designed to provide adequate time for evacuation and possibility of containment.

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SPECIFICATIONS

SECTION BREAKDOWN

Addendums and Clarifications

Contract Stuff -

SECTION 00000 - 01000 : CONTRACTUAL ARRANGEMENTS

Outside Stuff -

SECTION 02000 : EXTERIOR WORKS

Heavy Weights -

SECTION 03000 : CONCRETE

SECTION 04000 : MASONRY

SECTION 05000 : STEEL

Middle Weights -

SECTION 06000 : CARPENTRY / WOODS

SECTION 07000 : INSULATION / CLADDING

SECTION 08000 : DOORS, WINDOWS, HARDWARE

Light Weights -

SECTION 09000 : FINISHES (PAINT, FLOORING,
CEILINGS)

SECTION 10000 : SPECIALITIES

Systems Engineers -

SECTION 15000 : MECHANICAL

SECTION 16000 : ELECTRICAL

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TYPICAL SPECIFICATION SECTION

PART I : GENERAL CONTRACTUAL ARRANGEMENTS

May include requirements for SAMPLES, SHOP DRAWING
SUBMISSIONS, DELIVERY DATES, REFERENCE SECTIONS

PART II : MATERIALS

Listing of all the materials to be used by the Section including type, grade,
conformance to ULC listings, composition, fasteners, colours, and finish surface.

PART III : EXECUTION

Descriptive method to illustrate how the MATERIALS are to be applied
on the project including spacing of fasteners, jointing, exposure, and sequence of
installation.

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(PROJECT)

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00004	LIST OF DRAWINGS
00030	BID ADVERTISEMENT
00100	INSTRUCTIONS TO BIDDERS
00300	BID FORM
00700	GENERAL CONDITIONS
00800	SUPPLEMENTARY GENERAL CONDITIONS

Division 1 - General Requirements

Section 01001	General Requirements
Form C	- Certificate for Substantial Completion of Subcontract
Form C-1	- Certificate for Substantial Completion of Contract

Division 2 - Sitework

Section 02050	Demolition
(Section 02200)	Excavation and Backfill)
(Section 02210)	Site Grading)
Section 02220	Building Excavation & Backfill
(Section 02230)	Granular Base Course)
(Section 02250)	Subgrade Preparation/Compaction)
Section 02300	Pile Foundation
Section 02610	Asphalt Paving
Section 02620	Gravel Paving
Section 02800	Landscaping
Section 02810	Planting Soil
Section 02820	Trees, Shrubs and Ground Covers
Section 02830	Landscape Maintenance

Division 3 - Concrete

Section 03100	Concrete Formwork
Section 03200	Concrete Reinforcing
Section 03250	Concrete Accessories
Section 03300	Cast-In-Place Concrete
Section 03346	Concrete Testing
Section 03347	Concrete Floor Finishing
Section 03400	Architectural Precast Concrete
Section 03420	Prestressed Concrete
Section 03510	Gypsum Concrete Deck

Division 4 - Masonry

Section 04200	Masonry
Section 04501	Masonry Restoration

Division 5 - Metals

Section 05100	Structural Steel
Section 05300	Metal Decking
Section 05500	Miscellaneous Metals

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Division 6 - Wood and Plastics

Section 06100	Rough Carpentry
Section 06125	Wood Decking
Section 06181	Glued-Laminated Structural Units
Section 06192	Prefabricated Wood Trusses
Section 06400	Millwork
Section 06415	Prefinished Cabinets

Division 7 - Thermal & Moisture Protection

Section 07211	Blown Insulation
Section 07420	Dryvit Finish
Section 07460	Metal Roofing
Section 07470	Metal Cladding
Section 07480	Asbestos Removal (Flooring)
Section 07500	Built-Up Roofing
Section 07510	Asphalt Shingles
Section 07530	Torch-Applied Roofing
Section 07532	EPDM Roofing
Section 07900	Sealants

Division 8 - Doors and Windows

Section 08100	Metal Doors and Frames
Section 08360	Overhead Doors
Section 08400	Aluminum Doors
Section 08410	Entrances & Storefronts
Section 08520	Aluminum Windows
Section 08530	Wood/Aluminum Windows
Section 08610	Wood Windows
Section 08710	Finish Hardware
Section 08800	Glass & Glazing
Section 08900	Curtain Wall

Division 9 - Finishes

Section 09150	Stucco
Section 09250	Drywall & Steel Studs
Section 09310	Ceramic Tile
Section 09510	Acoustical Ceilings
Section 09650	Resilient Flooring
Section 09680	Carpeting
Section 09841	Sprayed Fireproofing
Section 09900	Painting

Division 10 - Specialties

Section 10001	Construction Specialties
Section 10006	Pre-Decorated Gypsum Board Partitions
Section 10760	Monitor Supports

Division 11 - Equipment

(N/A)

Division 12 - Furnishings

(N/A)

Division 13 - Special Construction

(N/A)

Division 14 - Conveying Systems

Section 14000	Hydraulic Passenger Elevators
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Section 14430

Stair Wheelchair Lifts

Division 15 - Mechanical

Section 15010	General Mechanical Provisions
Section 15042	Testing
Section 15043	Balancing
Section 15060	Pipe and Pipe Fittings
Section 15090	Supports, Anchors and Seals
Section 15100	Valves, Cocks and Faucets
Section 15140	Pumps
Section 15160	Vibration Isolation
Section 15161	Expansion Compensation
Section 15175	Tanks
Section 15181	Piping and Equipment Insulation
Section 15190	Duct Insulation
Section 15401	Plumbing General
Section 15450	Plumbing Fixtures and Trim
Section 15475	Pipe Cleaning and Chemical Treatment
Section 15600	Air Conditioning & Refrigeration Specialties
Section 15622	Steel Tube Boilers
Section 15705	Glycol System
Section 15710	Hot Water Specialties
Section 15739	Terminal Heat Transfer Units
Section 15750	Coils
Section 15763	Air Handling Unit
Section 15771	Packaged Rooftop Heating/Cooling Units
Section 15820	Fans
Section 15840	Ductwork
Section 15855	Breeching
Section 15860	Duct Accessories
Section 15870	Air Outlets
Section 15880	Air Filters
Section 15900	Controls

Division 16 - Electrical

Section 16010	Electrical General Provisions
Section 16111	Conduits, Fastenings & Fittings
Section 16112	Basic Material, Outlet Boxes, Conduit Boxes & Fittings
Section 16131	Splitters, Junction Pull Boxes & Cabinets
Section 16301	Conductors
Section 16304	Armoured Cables
Section 16380	Secondary Equipment, Wiring Devices
Section 16402	Underground Service
Section 16420	Distribution
Section 16421	Service Entrance Board
Section 16450	Grounding - Secondary
Section 16592	Lighting Control Equipment, Photoelectric
Section 16701	Fire Alarm System
Section 16727	Security Alarm System
Section 16740	Telephone Raceway System
Section 16741	Intercom/Classcall/Sound System
Section 16780	Television System
Section 16800	Lighting
Section 16820	Computer Conduits
Section 16911	Motors & Controls, Starter to 600 Volts

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FINAL QUIZ

1. You only really need either Drawings or Specifications; not both.
 True
 False
2. The General Conditions Section of the Specifications relates only to the General Contractor's responsibilities.
 True
 False
3. All information is always shown on the drawings.
 True
 False
4. All drawings are done to the same scale.
 True
 False
5. The first thing to check when picking up contract sets is the Title Block/Title Page.
 True
 False
6. Schedules are contained either on the drawings or in the specifications.
 True
 False
7. Section arrows indicate the direction of view.
 True
 False
8. If something is not shown on the drawings, it does not get included in the contract.
 True
 False
9. Changes to the documents by addendum overrule what is shown on drawings or original specs.
 True
 False
10. Each specification trade section has 3 sub-sections.
 True
 False
11. Changes can be made to the drawings/specs without consultant approval.
 True
 False

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12. All specifications are written in the National Master Specifications format.
 - True
 - False
13. Bid depository trade definitions overrule the consultant/client's expectations.
 - True
 - False
14. Materials are shown on the drawings, and identified in writing within the specifications.
 - True
 - False
15. Specific details can be placed anywhere within a contract set (either drawings or specifications)
 - True
 - False
16. Grid lines are what consulting fees are based on. They have no other purpose on the documents.
 - True
 - False
17. Large scale details are more important/precise than small scale details.
 - True
 - False
18. Building codes were written to ensure protection of property and life.
 - True
 - False
19. Sub-trades need only review the one spec section and single drawings relative to their trade.
 - True
 - False
20. Construction documents may be comprised of separate specifications and drawings, specs on the drawings, or drawings in the specs.
 - True
 - False