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Concrete Specifications

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Specifying how you want your concrete to perform, last and look is very important to obtaining the product desired. Considerations and research need to occur before specifying concrete requirements:

- Where is the concrete being placed - Location?
- What type of exposure will this concrete have – Freeze-thaw, sulfate, chloride?
- If reinforcing is required, what is the spacing of reinforcing?
- Will it be pumped into place or will it be delivered from chute of truck?
- Will the concrete be used in a high moisture area?
- What type of finish is required?
- Strength requirements and at what age?
- Workability requirements (slump, flow, etc.)

This type of information is very important to communicate between parties involved so the design professional can properly specify the requirements for the concrete being used.

Specifications for concrete can be written in a prescription style or performance style. There are many advantages of moving towards performance style specifications. The concrete industry and the National Ready Mixed Concrete Association (NRMCA)

have dedicated efforts and information supporting the use of performance specifications. Supporting information can be found at www.nrmca.org/p2p. Additionally, the American Concrete Institute (ACI) www.concrete.org has a dedicated committee “Performance Criteria for Ready Mixed Concrete” (ACI Committee 329) and a “Report on Performance-Based Requirements for Concrete” (ACI 329R-14) supporting use of performance style specifications. Professionals involved with the developing of specifications are encouraged to visit these sites for detailed information on use of performance versus prescription specifications.

Specifications are written in an organized manner such as MasterSpec that provides a structure to the specification so contractors and reviewers can easily find requirements for their part of a project. For instance, typically concrete requirements can be found in Section 3300 of a specification with additional requirements sometimes on the structural plan notes. Towards the front of these specifications there is an area called REFERENCE SPECIFICATIONS, CODES, AND STANDARDS. This area will list different specification codes and standards that are referenced. One recent review shows a total of five references to ACI and nineteen references to ASTM standards. While this may seem like a lot of references it does give you the reference to where requirements and information originate.

Part of the requirements of specifications is to prepare and send a submittal package. This information requirement has grown over the years and some-

times can take quite the effort to put together. Types of information may include:

- Source of concrete materials
- Test results and certifications for materials
- Safety data for materials
- Manufacture product data and technical recommendations for use of admixtures
- Concrete mix design data showing testing and compliance with codes for development of concrete mixtures

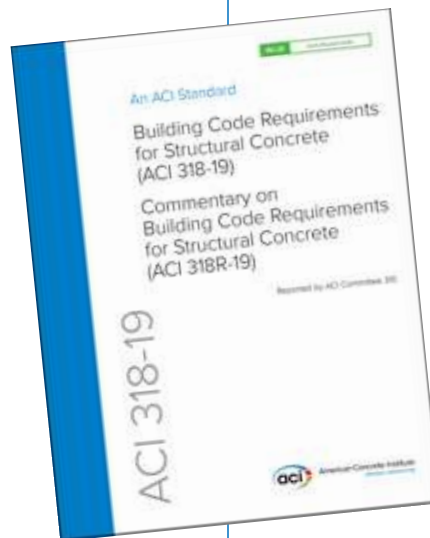
As you can imagine, specifications submittals for projects can be quite intensive however, as these requirements have grown for submittal purposes the resources have grown and developed to make the information more readily available.

Requirements for durability are listed in the ACI 318 building code in section 19.3. Table 19.3.1.1 lists exposure categories and classes. The licensed design professional will list the exposure class and category for each of these areas in structural concrete. Then in table 19.3.2.1 the requirements for concrete in each of the exposure category and class are listed. These requirements in many cases use maximum w/cm ratios and minimum strength levels. In other cases, it may be supplementary cementitious material (SCM – ex. fly ash, slag, silica fume, metakaolin, natural pozzolan) is required or a specific type of cement is required. The checking of proposed concrete mix designs for use in these areas of exposure is necessary to assure the compliance to code.

Area of use for concrete mixtures is very important in conversation with the contractor. We have worked with contractors to meet certain material requirements for months only to find out that an

additional use requirement completely negated the materials submitted due to inherent properties of the original material. Check to make sure that specifications requirements for materials are compatible with materials available. At times a property requirement in specifications may not be able to be met with local materials and importation of material becomes necessary to meet requirements.

Specifications should consider guides developed for use. ACI has several such guides. One would be the Guide to Concrete Floor and Slab Construction (ACI 302.1R-15). One example of guidance can be found in section 8.8.1 Air-entraining admixtures of this guide. This guide states “Entrained air is not recommended for concrete to be given a smooth, dense, hard-troweled finish because blistering and delamination may occur (Suprenant and Malisch 1999a)”. This is just an example of information that these guides can supply to a project being designed.



Referring back to the area of REFERENCE SPECIFICATIONS, CODES, AND STANDARDS in concrete specifications, this is an important area of the specification as it will list other areas where information can be found as it relates to your specification. While the actual concrete specifications will list requirements for the concrete in the project, at times researching the reference specifications, codes and standards may provide information as related to actual requirements in the project specifications when questions arise as to requirements.

Concrete specifications provide a pathway to concrete meeting the goals of a project in terms of ease of use, economics, sustainability, and long-life designs. While specification requirements have grown over the years, the knowledge of concrete design

has also grown, and concrete becomes more versatile in meeting the need of projects.

Where to look for referenced specifications, codes and standards:

American Concrete Institute (ACI) - <https://concrete.org/>

American Society of Testing and Materials (ASTM) - <https://www.astm.org/>

Federal Aviation Administration (FAA) - https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentID/1035128/

International Building Code - <https://codes.iccsafe.org/content/IBC2018>

International Residential Code - <https://www.iccsafe.org/products-and-services/i-codes/2018-i-codes/irc/>

American Railway Engineering and Maintenance-of-Way Association (AREMA) - https://publications.arema.org/Publication/MRE_001

Unified Facilities Guide Specifications (UFGS) - <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs>

Washington Department of Transportation - <https://wsdot.wa.gov/Publications/Manuals/M41-10.htm>

Oregon Department of Transportation - https://www.oregon.gov/odot/Business/Pages/Standard_Specifications.aspx

California Department of Transportation - <https://dot.ca.gov/programs/design/ccs-standard-plans-and-standard-specifications>

Idaho Department of Transportation - <https://itd.idaho.gov/business/>

Nevada Department of Transportation - <https://www.nevadadot.com/doing-business/contractors-construction/contract-services/standard-specifications-and-plans>

Arizona Department of Transportation - <https://azdot.gov/business/contracts-and-specifications/specifications>

Utah Department of Transportation - <https://www.udot.utah.gov/connect/business/standards/>



Pioneer Sand & Gravel trucks pouring concrete for the Space Needle in Seattle, WA. c.1961

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