



Constructability Checklist

An Associated Builders and Contractors - Virginia Chapter membership survey of the most common drawing and specification problems is now the basis of this easy to use *Constructability Checklist*. Owners and Designers, use this helpful checklist before releasing your submission. It will help you save money, time, and frustration.

*A publication of
Associated Builders and Contractors , Virginia Chapter, General Contractors Council*

TABLE OF CONTENTS

1.

Project Manual

General Scope of Work, Contract, Conditions of the Contract, Instructions to Bidders
Technical Specifications

2.

Drawings

General

Title Blocks, Scales, Symbols, Abbreviations, Sheet #

Geometry [Dimensions, Angles, Radii, Fixed Positions & Benchmarks, etc.]

Civil

Structural

Architectural

Conveyance

Mechanical, General

HVAC

Plumbing

Sprinkler

Electrical

3.

Life Safety

4.

Interdisciplinary Coordination

ABC-VA would like to extend a special thanks to Peter J. Forella, Director of Consulting Services at Centex Construction Company, Inc. Mr. Forella assisted with the survey, analyzed the raw data, and generated on behalf of the General Contractors' Council the attached document.

1. PROJECT MANUAL

1.22 Is the strategy for submittal processing, quality control, testing, inspections, and mock-ups suitable and adapted to the subject project?

1.23 Standards

1.23.1 Are appropriate standards of performance, quality and testing cited?

1.23.2 Do they correspond to what is specified and drawn?

1.23.3 Are they current?

1.23.4 Examples: UL standards, FM standards, ASTM standards?

1.24 Products

1.24.1 Do all of the specified products match what is drawn or specified?

1.24.2 Examples: catalog numbers, model numbers and processes?

1.25 New Systems, Assemblies, Products unfamiliar to the local market or designer:

1.25.1 Has there been an adequate evaluation?

1.25.2 Will unwanted delays result?

1.25.3 Are the submittal requirements reasonable?

1.25.4 Has the Owner been advised of these issues?

1.26 Are the specifications formatted according to accepted standards of practice, such as CSI's Manual of Practice, MasterFormat, SectionFormat and PageFormat? Non standard specification formats are not recommended.

1.27 Are the warranty strategies coordinated, clear and reasonable? When exposed to the intended uses and environments, such as traffic, solar radiation, thermal cycles and moisture, will the completed construction achieve the life expected by the Owner?

1.28 Is there boilerplate content that has not been tailored to the subject project?

1.29 Sole source and/or proprietary specifications

1.29.1 Are there sole source and/or proprietary specification sections?

1.29.2 Are they necessary?

1.29.3 Will substitutes to proprietary specifications be accepted?

1.30 Has the relevant knowledge gained from problems recently experienced on previous projects been carried forward to the subject project?

ADDITIONAL ISSUES [insert here]:

Reviewer's
Notes

2. DRAWINGS

Reviewer's Notes

General

2.01 Are all of the views needed to construct provided, such as plans, elevations, sections, schedules, riser diagrams, and details?

2.02 Are all the necessary supplementary documents provided to define the relevant existing conditions, for example, land surveys, geotechnical, environmental?

2.03 Do all large scale plan views match the smaller scaled views?

2.04 Is the layout and content of each sheet clear, concise, make sense?

2.05 Is there adequate cross referencing?

2.06 Have matchlines been used only when absolutely necessary?

2.07 Is all built-in equipment scheduled? Are all of the necessary rough-ins indicated?

2.08 Are all relevant plane transitions detailed?

2.09 Is there boilerplate content that has not been tailored to the subject project?

2.10 Have the subconsultant disciplines been combed for issues that are unsightly. For example, exposed work that should be concealed by an architectural finish?

Title Blocks, Scales, Symbols, Abbreviations, Sheet #

2.11 Are all symbols and abbreviations provided in the appropriate legends?

2.12 Are all scales correctly shown?

2.13 Are the title blocks complete and current?

2.14 Is the drawing-layering, sequencing and numbering in conformance with CSI's Uniform Drawing System [UDS]?

2.15 Have all of the *drawn by* and *checked by* blocks been initialed? Have the drawings that are initialed been carefully checked?

ADDITIONAL ISSUES [insert here]:

<p>2. DRAWINGS <i>continued</i></p> <p><i>Geometry [Dimensions, Angles, Radii, Fixed Positions & Benchmarks, etc.]</i></p> <p>2.20 Have all of the dimensions, angles, radii, fixed benchmarks been established?</p> <p>2.21 Does the above geometric information translate to all of the subconsultant's sheets, where relevant?</p> <p>2.22 Will all of the construction systems and assemblies fit within the available spaces leaving all of the necessary clearances and tolerances for operational, maintenance and replacement access?</p> <p>2.23 Are the site grade elevations, finish floor elevations and building location footprints coordinated with the other disciplines?</p> <p>2.24 Are the dimensional strings as simple and clear as possible? Do they all <i>close</i> or can they be easily <i>parity</i> checked against overall dimensions? Are the start points and end points of every dimension unmistakably clear?</p> <p>2.25 Dimensions requiring a construction worker to add or subtract because a dimensional string commences from an unreachable point are derivative dimensions. Have derivation dimensions been avoided or minimized?</p> <p>2.26 Have all drawings that show a graphic scale been drawn at that scale?</p> <p>2.27 Will alternate or approved substitutes also fit when the details provided have been developed around a specific manufacturer?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>

--	--

<p>2. DRAWINGS <i>continued</i></p> <p><i>Civil</i></p> <p>2C1. Are all relevant controlling datum/benchmarks, property lines, set backs, easements, rights of way, legal incumbrances, relevant existing conditions, existing and proposed contours, existing and proposed inverts, and limits of construction been indicated?</p> <p>2C2. Has the electrical engineer's electrical site plan been coordinated with the civil engineering site plans, landscape plans and profiles?</p> <p>2C3. Are all of the primary utilities shown, connected and coordinated on the MEP documents?</p> <p>2C3. Do all pipes and structures appear reasonably sized?</p> <p>2C4. Are all profiles coordinated with the plan views. Are all relevant utilities shown on profile sheets where they run close or cross each other?</p> <p>2C5. Do all exposed surfaces have positive drainage to move water away from potential incursion zones and towards catchments or drain locations?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>
--	------------------------------------

--	--

	Reviewer's Notes
<p>2. DRAWINGS <i>continued</i></p> <p><i>Structural</i></p> <p>2S1. Are all the relevant <i>primary</i> structural elements shown, sized, scheduled, detailed and coordinated to the extent necessary to construct, for example:</p> <p><i>Substructure</i></p> <p>2S1.1 Underpinning?</p> <p>2S1.2 Sheeting and shoring?</p> <p>2S1.3 Footings, piers?</p> <p>2S1.4 Below grade walls?</p> <p><i>On-Grade</i></p> <p>2S2.1 Raft slabs?</p> <p>2S2.2 Slabs on grade, slab thickenings, grade beams, depressed slabs, troughs, pads?</p> <p><i>Superstructure</i></p> <p>2S3.1 Columns?</p> <p>2S3.2 Girders?</p> <p>2S3.3 Beams?</p> <p>2S3.4 Decks?</p> <p><i>Secondary structural elements</i></p> <p>2S4.1 Bearing plates?</p> <p>2S4.2 Lintels?</p> <p>2S4.3 Bracing?</p> <p>2S4.4 Bridging?</p> <p>2S4.5 Joints?</p> <p>2S4.6 Clips, connections, etc.?</p> <p><i>Surface Treatments</i></p> <p>2S5.1 Fireproofing?</p> <p>2S5.2 Waterproofing, coatings, sealers?</p> <p>2S6. Do all of the structural perimeter overhangs match the architectural, for example roof overhangs and projections?</p> <p>2S7. Are all primary utility assemblies coordinated with all below grade structural foundation and wall conditions?</p> <p>2S8. Have all of the relevant equipment loads and supports been structurally accommodated and detailed?</p> <p>2S9. Will the expansion and control joint designs and locations handle the differential movements? Are they coordinated with all the other effected disciplines?</p> <p>2S10. Shaft and chase penetrations through floors can effect many other design disciplines. Are all penetrations coordinated with all the other effected disciplines?</p> <p>2S11. Are all structural elements such as footings and columns correctly designated and scheduled?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	

--	--

	Reviewer's Notes
<p>2. DRAWINGS <i>continued</i></p> <p><i>Architectural</i></p> <p><i>General</i></p> <p>2A1 Do the interior and exterior functions, massing, spacial organizations, circulation, future expansions, appearance, quality levels address the programmatic requirements?</p> <p><i>Exterior Enclosure</i></p> <p>2A2 Primary Enclosure Systems and Assemblies: identified and coordinated? 2A2.1 Examples: Masonry, Precast Concrete, EIFS, Glass & Glazing 2A3 Secondary Enclosure Elements: identified and coordinated? 2A3.1 Examples: Precast concrete trim, lintels, spandrel beams, knee braces, etc.?</p> <p><i>Exterior Enclosure Moisture Control Systems and Assemblies</i></p> <p>2A4 Identified and coordinated? 2A4.1 Above Grade Examples: Roofing, waterproofing, damproofing, condensation controls, architectural sheet metals and flashings, weeps, caulking, glazing, drainage to daylight? 2A4.2 Below Grade Examples: drainage board or gravel, foundation drains, sump pits, French drains?</p> <p><i>Exterior Enclosure Thermal Control Systems and Assemblies</i></p> <p>2A5 Identified and coordinated? 2A5.1 Examples: Insulation, caulking, and glazing?</p> <p><i>Exterior Enclosure Connections and Details</i></p> <p>2A6 Interior ceiling and wall locations coordinated with window wall framing? 2A6.1 Sill and head flashing? 2A6.2 Coatings, priming, galvanizing? 2A6.3 Joining of dissimilar materials? 2A6.4 Finish hardware? 2A6.5 Weld certification requirements? 2A6.6 Tolerances and clearances? 2A6.7 Expansion design? 2A6.8 Maintenance Details: For example strategy for keeping clear critical weeps, gutters?</p> <p><i>2A7. Shafts and Chases</i> 2A7.1 Will the shafts and chases accommodate all the intended assemblies?</p>	

--	--

<p>2. DRAWINGS <i>continued</i></p> <p><i>2A8. Finishes</i> 2A8.1 Scope, limits [horizontal and vertical], bulkheads, transitions, and room numbers indicated and coordinated on the Finish Schedules, Reflected Ceiling Plans, Interior and Exterior Elevations? 2A8.2 Are all finishes, special coatings, surface treatments and colors identified and scheduled?</p> <p><i>2A9. Casework, Built-in Equipment & Specialties</i> 2A9.1 Is the scope fully indicated? 2A9.2 Will it fit as drawn? 2A9.3 Is all of the necessary information provided, for example the interior / exterior surfaces, hardware, details, specifications, schedules?</p> <p><i>2A10. Doors, Frames & Hardware [HW]</i> 2A10.1 Is all of the finish HW indicated, specified and coordinated? 2A10.2. Are doors, frames and HW assemblies coordinated with required undercuts [to permit air flow], electrified hardware, door security requirements and code requirements? <i>2A11 Coordinated Imbeds, Anchors, Supports, Blocking</i> 2A11.1 Are all concrete imbedded items fully identified and specified? 2A11.2 Are all the necessary connection details, anchors, hardware, supports, backing and blocking coordinated, detailed and specified?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>
---	--------------------------------

--	--

2. DRAWINGS <i>continued</i>	Reviewer's Notes
<p><i>Conveyance</i></p> <p>2Conv1. Are all the necessary dimensional and rough-in requirements indicated and coordinated?</p> <p>2Conv2. Is there a disconnect required at the elevator machine room?</p> <p>2Conv3. Is there a shunt trip required at the elevator shaft?</p> <p>2Conv4. Are the pit requirements fully detailed, for example, rough-in requirements, waterproofing, drains, sump pumps, lights?</p> <p>2Conv5. Is the door circuitry coordinated with the life safety systems?</p> <p>2Conv6. Are the cab details sufficient to price or has a suitable allowance been established?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	

--	--

	Reviewer's Notes
<p>2. DRAWINGS <i>continued</i></p> <p><i>Mechanical</i></p> <p><i>Mechanical, General</i></p> <p>2M1. Is the design a complete system, from supply connection to terminus?</p> <p>2M2. Are all sizes provided?</p> <p>2M3. Do all sizes appear reasonable?</p> <p>2M4. Do they match all the riser diagrams provided?</p> <p>2M5. Does each component fit with everything else occupying the same volume? Have the necessary thicknesses of insulation, jackets and housings been considered?</p> <p>2M6. Have repeating problems of the past been debugged such as coordination of the starters, disconnects, interlock wiring, smoke detectors, color-coding, stenciling responsibilities?</p> <p>2M7. Do all mechanical and architectural reflected ceiling plans match? For example, are the registers, grills and equipment located in the same place mechanically and architecturally?</p> <p>2M8. Are all sleeve locations coordinated with concrete?</p> <p>2M9. Are required composite coordination drawings specified? Has the composite coordination drawing - lead trade - been specified?</p> <p><i>HVAC</i></p> <p>2HVAC1. Are the quantities and sizes provided of all equipment, fixtures, piping, ductwork, controls, special accessories, etc.?</p> <p>2HVAC2. Are duct outside sizes including insulation also indicated to ensure the insulation will fit?</p> <p>2HVAC3. Are all the required fire dampers indicated in the correct locations?</p> <p>2HVAC4. If there are any large duct runs over bathrooms with ceiling mounted toilet partitions. Have these conflicts been coordinated?</p> <p>2HVAC5. Are the control sequences, such as those pertaining to the kitchen exhaust fans been coordinated with the fire alarm system and the local authority? Have the necessary diagrams been provided?</p> <p>2HVAC6. Have the necessary riser diagrams been provided?</p> <p>2HVAC7. All equipment & fixtures scheduled?</p> <p>2HVAC8. Does the Site Plan indicate the relevant location, sizes & connections of, for ex., cooling towers, fuel oil storage system, etc.?</p> <p>2HVAC9. Interior exhaust fans and roof fans</p> <p><i>Plumbing</i></p> <p>2Plumb1. Are the quantities and sizes provided of all equipment, fixtures, piping, special accessories, etc.?</p> <p>2Plumb2. Are floor and roof drains located and dimensioned?</p> <p>2Plumb3. Are waste line clean outs spaced per code?</p> <p>2Plumb4. Has the roof overflow system been correctly indicated?</p> <p>2Plumb5. Has a backflow preventer at the incoming water service been correctly indicated?</p>	

--	--

2. DRAWINGS <i>continued</i>	Reviewer's Notes
<p>2Plumb6. Has floor drain trap priming been clearly specified?</p> <p>2Plumb7. Are all valves sized and shown?</p> <p>2Plumb8. Have the necessary riser diagrams been provided?</p> <p>2Plumb9. Does the Site Plan indicate the relevant location, sizes & connections of, for ex., fuel oil storage system, etc.?</p> <p><i>Sprinkler</i></p> <p><i>Note: the following may apply only to the Sprinkler Subcontractor Submission.</i></p> <p>2Sp1. Are the quantities and sizes provided of all equipment, fixtures, piping, special accessories, etc.?</p> <p>2Sp2. Do sprinkler drops and heads conflict with any other construction?</p> <p>2Sp3. Have fire and jockey pump assemblies been shown and coordinated?</p> <p>2Sp4. Have the necessary riser diagrams been provided?</p> <p>2Sp5. Does the Site Plan indicate relevant location, sizes & connections?</p>	

--	--

2. DRAWINGS <i>continued</i>	Reviewer's Notes
<p><i>Electrical</i></p> <p>2E1. Has a layout of all the relevant electric panel and equipment rooms been provided?</p> <p>2E2. Are the voltage and phasing requirements shown and coordinated with those required by the mfrs/suppliers/contractors of the mechanical systems, electrical systems, fire alarm system, security system and other special systems?</p> <p>2E3. Do the fixture quantities differ between architectural and electrical engineering drawings?</p> <p>2E4. Has missing device circuitry been checked for?</p> <p>2E5. Is the required rating of the fire alarm strobe provided?</p> <p>2E6. Are all of the floor boxes indicated and accurately specified?</p> <p>2E7. Are the panels and electrical switch gear reflected in both the plan views and riser diagrams and coordinated with the other disciplines?</p> <p>2E8. Have the necessary contacts with the power and communications primary service utilities been made? Is the relevant information reflected on the contract documents? Example: power company, telephone company, plus any specialized communications firms such as Cable TV, wireless, satellite?</p> <p>2E9. Have all of the special electrical requirements been adequately shown, for example, electrified door hardware assemblies?</p> <p>2E10. Has all of the necessary empty conduit been indicated, such as conduit required for the elevator fire alarm and controls?</p> <p>2E11. Have any electrical panels been recessed into rated walls without the necessary rated protections?</p> <p>2E12. Are controls, starters and EMS protocols coordinated?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	

--	--

<p>3. LIFE SAFETY</p> <p><i>3.10 General</i></p> <p>3.11 Is the design compliant with all relevant codes, standards and regulations? For example, most projects must simultaneously conform to numerous layers of Federal, state and local codes and regulations plus other standards that may included by incorporation.</p> <p>3.12 Is there adequate coordination between the owner, design professionals, contractors and the relevant governing code officials including the officials responsible for enforcing zoning, site, building, transportation, utilities, health, etc.?</p> <p>3.13 Has all the necessary research and coordination with governing authorities, such as historic, architectural and community review boards been completed?</p> <p>3.14 Do all of the cited standards match what is shown on the drawings or specified? For example, UL standards, FM standards, ASTM standards?</p> <p>3.15 Has all of the contractor provided jurisdictional permit fees and labor to process been indicated?</p> <p><i>3.20 Fire Separations, Protections and Retardencies</i></p> <p><i>Are all of the following identified where applicable and in conformance with the applicable codes?</i></p> <p>3.21 Wall, floor, ceiling and roof ratings?</p> <p>3.22 Vertical egress, shaft and chase ratings?</p> <p>3.23 Horizontal egress ratings?</p> <p>3.24 Spray-on fireproofing and other fireproofing protections of specific elements?</p> <p>3.25 Door ratings [labels], closers, wire glass or listed fire rated glass?</p> <p>3.26 Smoke controls, such as smoke hatches, compartments?</p> <p>3.27 Correlated MEP ratings and enclosures such as at flues and exhaust stacks?</p> <p>3.28 Carpet, wallcovering and drape retardencies?</p> <p><i>3.30 Discharge and paths of egress</i></p> <p><i>Are all of the following vertical and horizontal discharge paths of egress efficient and clear?</i></p> <p>3.31 Egress loading units?</p> <p>3.32 Egress identification signs, etc?</p> <p>3.33 Egress lighting?</p> <p>3.34 Stair and railing designs?</p> <p>3.35 Number of exits?</p> <p>3.36 Exit widths?</p> <p>3.37 Lighting?</p> <p>3.38 Dead end corridor lengths?</p> <p>3.39 Travel distances?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>
--	------------------------------------

--	--

<p>3. LIFE SAFETY <i>continued</i></p> <p>3.40 ADA <i>Are all of the following in conformance with the applicable codes?</i></p> <p>3.41 Building Entrance? 3.42 Parking? 3.43 Ramps? 3.44 Vision impaired items? 3.45 Signs? 3.46 Toilet room clearances, stall door widths, door swing and five foot radii, plumbing fixtures</p> <p>3.50 Primary Utilities</p> <p>3.51 Have all jurisdictionally adopted codes and standards of practice pertaining to primary utilities been adequately reflected? 3.52 Have all of the contractor provided primary utility fees, connection fees, availability fees and labor to process been indicated?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>
---	--------------------------------

--	--

<p>4. INTERDISCIPLINARY COORDINATION</p> <p>4.1 Are the design disciplines coordinated as necessary to complete the project?</p> <p>4.2 Refer to <i>Geometry [dimensions, angles, radii, etc.]</i> above, regarding systems and assemblies fitting within the available spaces.</p> <p>4.3 Have equipment weights, noise, vibration, heat and fumes been managed to the degree the Owner anticipates?</p> <p>4.4 Do all the drawing backgrounds of the various disciplines match?</p> <p>4.5 Do all details on the drawings correspond with what has been specified and vice versa?</p> <p>4.6 Do the documents reflect all of the necessary trade interfaces? For example, does the electrical design provide the right voltage and phase to the right location of every mechanical device? Has all the necessary concealed blocking been provided for subsequent trades requiring it to complete their work?</p> <p>4.7 Have all interstitial spaces, ceiling spaces, shafts, wet stacks, chase and furred spaces been properly sized to accommodate all current and future systems? Has adequate access been provided?</p> <p>4.8 Are all of the necessary MEP hangers and supports provided?</p> <p>4.9 Are all concealed, cast-in and imbedded items indicated and coordinated?</p> <p>4.10 Has there been a review to verify there are no incomplete, incorrect or circular <i>intra</i> or <i>interdisciplinary</i> referencing?</p> <p>ADDITIONAL ISSUES [insert below]:</p>	<p>Reviewer's Notes</p>
---	------------------------------------

--	--

Associated Builders and Contractors - Virginia Chapter General Contractor's Council is seeking positive ways to enhance the processes that lead to successful construction projects.

Associated Builder's and Contractors - Virginia Chapter *General Contractor's Council* may be reached at 14120 Parke Long Court, Suite 111, Chantilly, Virginia 20151
Phone Number: [703] 968-6205, Website: www.abcva.org

Regarding this publication, please direct comments or suggestions via email to Patrick Dean, President, (703) 968-6205, pat@abcva.org

DISCLAIMER

The materials provided herein represent basic themes and suggested minimums when reviewing design documents for construction. This publication is not intended to be either all inclusive or a substitute for a comprehensive quality assurance program.