

Appendix P-3a: Integrated Design Process Supporting Information

Introduction

The integrated design process refers to the bringing of the Work Team members together early in the design process and to the creation and execution of plans in order to effectively manage the design and construction process.

Elements included in P.3 (previously contained in guideline P.4 under version 2.1 of the B3 Guidelines) are related to the creation and execution of an IEQ Safety Risk Assessment of indoor air quality issues, Construction Air Quality Management Plan, Correction Period Air Quality Management Plan, and the Construction Waste Management Plan. The elements of these plans are outlined below.

The creation and execution of the following plans are required as part of Guideline P.3B

- The Design Intent Document (DID), which shall quantify functional performance expectations and parameters for each system to be commissioned.
- The Basis of Design (BOD) document, a narrative description of how the systems will be designed in order to achieve the design intent acceptance criteria
- Construction Air Quality Management Plan (including safety risk assessment of existing conditions, and protection of occupants in spaces adjacent to construction work.)
- Correction Period Air Quality Management Plan
- Construction Waste Management Plan

The following is a description of how the Integrated Design Process shall evolve over the course of the project.

Agency Planning

- Create and distribute to all stakeholders a communication plan and a team roster with all contact information included.
- Hold comprehensive Business Planning Workshop.
- The Guideline Leader (with Design Team) for the Agency is responsible for introducing the B3 Guidelines to the agency at the initial discussion of a new project. The early planning of the project generally includes a group discussion about the needs of the agency and requirements for a project. The B3 Guidelines shall be incorporated into the Comprehensive Business Plan and Strategic Plan for each Agency.

Pre-Design/Programming & Pre-Design/Site Selection

- Complete safety risk assessment of existing indoor air quality problems if work is to be attached to or renovated within an existing building.
- Create or update and distribute to all stakeholders a communication plan and a team roster with all contact information included.
- Hold Programming Workshop.
- The programming workshop is to be expanded to include discussion about the B3 Guidelines Guidelines. The workshop will include B3 Guidelines education for the design team and the stakeholders. The intent is to incorporate the B3 Guidelines into the programming discussion. An example of a format for this workshop can be found under tools: "Visioning Work Meeting/Client Awareness", provided in a supplementary publication.

Schematic Design

- Create Design Intent Document
- Create Basis of Design Document
- Create or update and distribute to all stakeholders a communication plan and a team roster with all contact information included.
- Assemble appropriate stakeholder team.
Include representation from every discipline that will be involved in the project, Owner's decision making designate, user, occupant, operations and maintenance representatives, at least one representative from the community, and at least one agency "client" or visitor representative. Also include owner representative and commissioning agent if applicable. Choose members who can make a commitment through post-occupancy review phase.
- Hold Facility Performance Workshop.
Schedule a Workshop within the first 2-3 weeks of the project. Include the stakeholder team. If some cannot attend a common date, include a representative on their behalf. Review programming document from Pre-Design and update as required. Review B3 Guidelines and revise project goals as required. Provide B3 Guidelines education for the team as required during this workshop.
- Convene multi-disciplinary team regularly for integrated progress review.
- Convene stakeholder team at least once during this phase for integrated progress review

Design Development

- Refine Design Intent Document
- Refine Basis of Design Document
- Create or update and distribute to all stakeholders a communication plan and a team roster with all contact information included.
- Convene multi-disciplinary team regularly for integrated progress review
- Convene stakeholder team at least once during this phase for integrated progress review

Construction Documents

- Complete Design Intent Document
- Complete Basis of Design Document
- Create the Following: (some templates available)
 - Construction Phase Air Quality Management Plan
 - Correction Period Air Quality Management Plan
 - Construction Waste Management Plan
 - Correction Period User Comfort & Satisfaction Assessment Plan

Construction Administration

- Create or update and distribute to all stakeholders a communication plan and a team roster with all contact information included.
- Convene multi-disciplinary team regularly for integrated progress review
- Convene stakeholder team at least once during this phase for integrated progress review
- Convene general contractor and subcontractors for pre-construction kick-off meeting to review the B3 Guidelines goals and objectives.
- Incorporate discussion about the progress toward project outcomes during every construction meeting. Use of the construction period related plans created or updated in

the Construction Documents phase, updated to reflect any system modifications or additions approved during Construction. Sections that may need to be changed include:

- Updated Construction Phase Air Quality Management Plan
- Updated Correction Period Air Quality Management Plan
- Updated Construction Waste Management Plan

Correction Period

- Using the plans created during the Construction Documents phase, update the following to reflect any system modifications or additions approved during Construction. Sections that may need to be changed include:
 - Updated Correction Period Air Quality Management Plan

The following are narrative descriptions of the activities (rows) in Appendix P-3d Design and Construction Commissioning Matrix.

1. GENERAL INTEGRATED DESIGN PROCESS TASKS

1.01 Conduct an organization/kick-off meeting including the team

Engaging an integrated project team early in the design process and creating strategies can facilitate the creation of a high-performance building.

1.02 Review Site Alternatives

Review Site Alternatives for their impact on the ability of the systems being commissioned to achieve their Design Intent criteria.

1.03 Engage Commissioning Team

The Commissioning Team assists in planning, reviewing and coordination of commissioning activities with all disciplines involved in the building project. The Commissioning Team shall include the following members at a minimum. Contractors will not join the team until they are selected through the normal procurement process.

- Commissioning Leader
- Facility Operations Manager (FOM)
- Project Manager
- Designers
- Contractors
- Energy Modeler (if energy modeling is part of the project)
- Guideline Leader

The Commissioning Leader facilitates and coordinates the efforts of the commissioning team. For Design and Construction Commissioning, the commissioning leader shall have a distinct role from the design team but may be employed within a firm providing design services.

The Facility Operations Manager is accountable for facility performance during ongoing occupancy and will manage or perform ongoing operations and maintenance following construction. This person is available to participate throughout the design and construction process for continuity into final operation.

1.04 Design Intent Document (as coordinated with Design and Construction Commissioning Plan, see Appendix P-4a and P-4b)

The Design Intent Document (DID) shall quantify functional performance expectations and parameters for each system to be commissioned. The DID provides the common understanding that focuses design, construction, and commissioning activities on the desired outcome. The DID shall be written in objective and measurable terms. Quantify parameters such as space temperatures, humidity levels, lighting levels, sound levels, and ventilation rates when applied to the conditioned building spaces. The DID should also include the project Energy Standard (kBtu/SF/Yr), energy modeling expectations, other related performance Guidelines: E-1, E-4, E-5, and E-8, and the Carbon Footprint value requirement.

- The DID shall be updated every time the owner accepts an alternate performance criteria –due to owner desires, schedule, or budget. This might occur through normal design evolution, value engineering, change orders, or other supplemental instructions during construction.
- During the Correction Period and On-Going Operations, the DID helps the owner/operators understand the original design intent. It also provides the benchmark for maintenance, repair, and replacement decisions.
- The DID shall include an updated SB2030 Energy and Carbon Standard for the project related to guidelines E-1, E-4, E-5 and E-8.
- If energy modeling is part of the project, the Energy Modeler provides the energy model’s inputs and outputs to the Commissioning Leader. The Commissioning Leader reviews the energy model’s inputs and outputs and confirms that the energy model matches the performance expectations and parameters documented in the DID (e.g., percentage improvements in the proposed building performance rating compared to the baseline building).

1.05 Basis of Design (as coordinated with Design and Construction Commissioning Plan, see Appendix P-4a and P-4b)

- The Basis of Design (BOD) is a narrative description of how the systems will be designed in order to achieve the design intent acceptance criteria
- If energy modeling is part of the project, the Energy Modeler provides the energy model’s inputs and outputs to the Designers and uploads the inputs and outputs to the on-line B3 Guidelines Tracking Tool. The Designers and the Sustainable Building 2030 reviewers review the energy model’s inputs and outputs in parallel to confirm that the energy model parameters match the system configurations outlined in the BOD.
- In addition, the Energy Modeler shall estimate the annual building energy consumption by energy-type which becomes part of the Systems Operations Manual. The Energy Modeler shall upload the annual energy consumption estimate to the on-line B3 Guidelines Tracking Tool. Refer to Section 6: Systems Operations Manual in Appendix P-5a: Operations Commissioning Supporting Information for more details on the initial allocation of building energy diagrams.

2. CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

2.01 Construction Air Quality Management Plan

The Construction Air Quality Management Plan shall cover practices to prevent introduction of air quality problems as a result of the construction process.

Meet construction air quality requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction. Requirements include elements for IAQ protection during construction (From CHPS section 01350, 1.6).

Indicate in the bid documents that compliance with the Construction Air Quality Management Plan is required.

2.02 Protect Stored Materials

Protect stored on-site or installed absorptive materials from moisture damage.

2.03 Replace Filtration Media

Replace all filtration media immediately prior to occupancy.

2.04 Temporary Construction Ventilation

Maintain sufficient temporary ventilation. Maintain ventilation continuously during installation, and until emissions dissipate after installation. If continuous ventilation is not possible via building's HVAC system(s) then ventilation shall be supplied via open windows and temporary fans, sufficient to provide no less than three air changes per hour. Air quality testing may be performed to demonstrate and maintain total VOC levels under 500 micrograms per cubic meter.

- Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in the Specifications or when air testing is performed, a time period of 72 hours may be used.
- Ventilate areas directly to outside. Ventilation to other enclosed areas is not acceptable.
- High VOC-products not pre-conditioned offsite may require a longer period of ventilation to achieve required VOC levels (see 2.06).

2.05 Protect HVAC System

During dust-producing activities (e.g., drywall installation and finishing), turn ventilation system off and protect openings in supply and return HVAC system from dust infiltration. Provide temporary ventilation as required.

Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside ducts.

2.06 Offsite Product Preconditioning

All products which have odors and significant VOC emissions shall be preconditioned off-site prior to delivery to the project site, OR air quality testing shall be performed and additional ventilation provided to ensure compliant VOC levels (see below). Allow products to off-gas in a dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions.

- Condition products without containers and packaging to maximize off-gassing of VOCs
- Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.
- Products subject to off-site preconditioning include (but are not limited to) flooring system components, composite wood and agrifiber products, furniture and furnishings, and ceiling and wall systems.

Flooring Systems Products:

Flooring system products include hard surface flooring (e.g., vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, wall base, etc.), carpet, and carpet cushions. The 14 calendar day preconditioning is not required if:

- The carpet is Green Label Plus certified,
- The carpet cushion is Green Label Plus certified, or
- The flooring products are FloorScore certified.

Composite Wood and Agrifiber Products:

Composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), plywood, whiteboard, strawboard, panel substrates, and door cores. If the composite wood and agrifiber products do not contain added urea-formaldehyde resins, the 14 calendar day preconditioning is not required.

Furniture and Furnishings

All desks, tables, and seats that were manufactured, refurbished, or refinished shall be preconditioned off-site for 14 calendar days prior to delivery to the Project site as described above.

Ceiling and Wall Systems

All gypsum board, insulation, acoustical ceiling systems and wall coverings installed in the interior spaces shall be preconditioned off-site for 14 calendar days prior to delivery to the Project site.

Offsite product preconditioning is not required for adhesives and sealants or paints and coatings. Offsite product preconditioning is also not necessary for materials compliant with one of the low-VOC requirements of Guideline I.2.

If air quality testing is performed it is sufficient to monitor areas with high-VOC materials for the 14-day period and provide adequate ventilation to maintain VOC levels under 500 micrograms per cubic meter during occupied hours of while construction workers are present.

2.07 Remove Moisture Damaged Materials

Moisture sensitive materials (including but not limited to wood, other plant-based products and gypsum board) with evidence of moisture damage are not acceptable. Stains may be evidence of moisture damage and should be evaluated. This includes both stored and installed materials. Immediately remove all such materials from the site and properly dispose.

Take special care to prevent accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products.

- Immediately remove from site and properly dispose of moisture-sensitive materials showing signs of mold and/or signs of mildew, including materials with moisture stains.
- Replace moldy materials with new, undamaged materials.

2.08 Protect Porous Materials

Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.

2.09 Building Flush-out Period

Comply with a pre-occupancy building flush-out as described in LEED NC Version 3.0 which states, "After construction ends, prior to occupancy and with all interior finishes installed, install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 degrees F and a relative humidity no higher than 60%." Note: schedule the completion of interior finish materials and occupancy accordingly to accommodate the flush out period.

If air testing is performed, demonstration of contaminant loads under the following levels is acceptable in lieu of the flush out period (note that these align with the relevant LEED 3.0 levels, to facilitate projects that are seeking dual compliance):

- Carbon Monoxide 9 ppm
- Particulates (PM10) 50 micrograms per cubic meter
- Total VOC 500 micrograms per cubic meter
- Formaldehyde 27 parts per billion

2.10 Pre-assessment of Existing Building Indoor Air Quality Problems

For New Buildings that are additions, or for Major Renovations, either A) ensure that ventilation flows between new or renovated areas and existing or non-renovated areas are decoupled or B) perform a pre-assessment of indoor air quality problems in the existing non-renovated portion, and the additions or to-be-renovated portions of the building. This pre-assessment should be done in the predesign phase, but no later than the schematic design phase by the design team. For path B, if there are problems in the non-renovated portion of the building that will be carried into the renovated zone by air movement common to the two zones of the building, these must be corrected prior to completion of the entire project. Also for path B, if there are problems in the to-be-renovated portion of the building, these must be corrected prior to completion of the entire project. The types of problems that must be addressed include, but are not limited to: air intakes in the older portion of the building that are now near major outdoor pollution sources, e.g., trucks idling, trash, or garbage areas; cleaning and/or disposal of moldy surfaces or asbestos in the renovated space following code requirements.

2.11 Protect Occupants in Adjacent Building Areas During Construction

Protect occupants in adjacent parts of the building from hazards associated with New Building additions or Major Renovations during construction.(1) Perform a safety risk assessment for potential hazards that may affect occupied zones in areas adjacent to the addition or major renovation. Potential hazards to consider include, but are not limited to: asbestos, mold, and chemicals involved in demolition or new construction in the addition or renovated areas.(2) The new construction zone and the adjacent non-renovated zone shall have either separate HVAC systems or be capped off from the renovated area using metal duct caps during construction. (3) The new construction zone shall be separated from the non-renovated portion of the building using a secure barrier that separates the atmosphere of the non-renovated portion from the renovated portion of the building. Fire resistive barriers that are caulked and taped to the existing structure are considered to be an example of such a barrier. Based on the risk assessment, air flow should be monitored.

3. CORRECTION PERIOD AIR QUALITY MANAGEMENT PLAN

3.01 Correction Period Air Quality Management Plan

The Correction Period Air Quality Management Plan shall involve periodic indoor air quality testing.

- Evaluate building air quality three months, six months, and ten months after occupancy with testing that verifies ventilation system is better than or within design guidelines.

- Consider (recommended, not required), monitoring three months, six months, and ten months after occupancy of other pollutants on I.4 guideline list which are not the pollutants that determine the ventilation rate. Concentrations should be in guideline range and below action value for each pollutant. Sample pollutant action levels are given in Appendix I-1
- Indicate in the bid documents that compliance with the Correction Period Air Quality Management Plan is required.

3.02 Three Month Building Air Quality Evaluation & Modifications

- Three months into the Correction Period measure the key factor that determines ventilation rate for building (major pollutant and/or CO₂) in all building occupied zones. “Occupied zones” shall be, at a minimum, one per air handling system. No single “occupied zone” shall be greater than 5,000 square feet. The testing plan shall take into account high occupancy spaces and the locations of specific pollutant sources and shall not necessarily depend on combined/average return air concentrations at each air handler. Record CO₂ concentrations in each zone. If using ventilation strategy B or C, compare to expected value for this zone.
- If CO₂ levels are above expected values, additional ventilation must be provided until concentrations fall below these levels.

3.03 Six Month Building Air Quality Evaluation & Modifications

Six months into the Correction Period repeat the Indoor Air Quality testing performed at three months and make any necessary correction until concentrations fall below action levels.

3.04 Ten Month Building Air Quality Evaluation & Modifications

Ten months into the Correction Period repeat the Indoor Air Quality testing performed at three and six months and make any necessary correction until concentrations fall below expected levels.

4. CONSTRUCTION WASTE MANAGEMENT PLAN

4.01 Construction Waste Management Specification

Specify the required activities and performance metrics for construction phase waste management in the bid documents. See Guideline M.3 Waste Reduction and Management for criteria.

4.02 Construction Waste Management Plan

Prepare a Construction Waste Management Plan. See Guideline M.3 Waste Reduction and Management for criteria. Consult your waste management provider as to whether on site sorting will be necessary to achieve the required waste diversion amount.

4.03 Debris Diversion

Divert construction, demolition, and land cleaning debris away from landfills.

4.04 Recycle Packaging

Recycle materials and equipment packaging.

4.05 Hazardous Waste

Reduce and properly handle hazardous waste.