March 20, 2019

TO: All Prospective Proposers

FROM: Christina Blair
Construction & Facilities Contracting Specialist

RE: GLEN TOWERS FAÇADE AND PLAZA IMPROVEMENTS AT TOWSON UNIVERSITY

Solicitation #19-022 AE-CB

Addendum #1, dated 03/20/2019

The following amends the above referenced solicitation documents and is issued as Addendum #1 dated 03/20/2019. The due date and time for Initial Technical Submittals remains Tuesday, April 16, 2019 on or before 2:00 p.m. Receipt of this addendum is to be acknowledged by completing the enclosed "Acknowledgement of Receipt of Addenda" form and including it with your technical proposal.

1. DOCUMENTS PACKAGED SEPARATELY

ADD:
Glen Towers/Plaza Improvements Program, dated December 14, 2018

END OF ADDENDUM #1

Enclosed: Addenda Acknowledgment Form, Glen Towers/Plaza Improvements Program, dated December 14, 2018

A/E RFP: #19-022 AE-CB
RFP FOR: AE SERVICES FOR GLEN TOWERS FAÇADE AND PLAZA IMPROVEMENTS AT TOWSON UNIVERSITY
DUE DATE: TUESDAY, APRIL 16, 2019 ON OR BEFORE 2:00 PM

NAME OF BIDDER: _____

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

The undersigned, hereby acknowledges the receipt of the following addenda:

Addendum No. ____1____ dated ___03/20/2019__

Addendum No. _____ dated _____

Addendum No. _____ dated _____

Addendum No. _____ dated _____

Signature _____

Printed Name_____

Title_____

Date_____

TOWSON UNIVERSITY

GLEN TOWERS/ PLAZA IMPROVEMENTS PROGRAM

December 14, 2018

GLEN TOWERS/ PLAZA IMPROVEMENTS

UNIVERSITY ADMINISTRATION

Kim Schatzel, Ph.D., President

David A. Vanko, Ph.D., Interim Provost and Executive Vice President for Acadmic Affairs

Benjamin Lowenthal, Vice President for Administation and Finance and Chief Fiscal Officer

Leah Cox, Ph.D., Vice President for Inclusion and Institutional Equity

Daraius Irani, Ph.D., Vice President for the Divison of Stragic Partnerships and Applied Research

Sara Slaff, Vice President for Legal Affairs and General Counsel

Deb Moriarty, Ph.D., Vice President for Student Affairs

Brian DeFilippis, Vice President for University Advancement

Marina Cooper, Vice President for University Marketing and Communications

University System of Maryland

Office of the Board of Regents
University System of Maryland
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Adelphi, Maryland 20783

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Lloyd "Milo" Miles, Chief Operating Officer

Ellen Herbst, Vice Chancellor for Administration and Finance

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PROJECT OVERVIEW

Founded in 1866, Towson University is recognized among the nation's best regional public universities offering more than 100 bachelors, masters and doctoral degree programs in the liberal arts and sciences, and applied professional fields. With more than 22,000 students, Towson University is the second-largest public university in Maryland. As a metropolitan university, Towson combines research-based learning with practical application. Our many interdisciplinary partnerships with public and private organizations throughout Maryland provide opportunities for research, internships and jobs.

Located in Towson, eight miles north of Baltimore, the campus is comprised of 328 acres, 54 buildings, over 5.4 million square feet of space, 5,569 on campus beds, and approximately 7,800 parking spaces. Current plans aim to grow enrollment to approximately 25,000 students at the main campus in Towson by 2029 at the earliest.

The Glen Complex was constructed in 1983. The complex was designed to accommodate student housing as well as dining and a gathering plaza. The Glen Complex includes 4 high rise towers accommodating 1,617 beds with centralized dining. The heart of the complex is the outdoor plaza connecting the towers and dining.

The major goals and objectives that must be addressed by the design of the facility are:

- Development of the site as an amenity and an integral part of the residential complex: Glen Towers A-D and Glen Dining hall.
- Façade improvements of the Towers to cover existing exposed concrete, replace storefront assemblies for improved thermal performance and replace canopies.
- Existing utilities have reached the end of their useful life and reaching an age at which need replacement. Utility improvements are required throughout plaza area and between towers related to storm water, sanitary and supply lines.
- Replacement of plaza waterproofing systems.
- Improvements to drop-off area, service, emergency (police and fire apparatus) access, and accessibility for people with disabilities in accordance with ADA regulations.
- Provision and separation of vehicular and pedestrian traffic.
- Improve loading and unloading logistics for student move-in.
- Update Towers' HVAC, ventilation and sanitary infrastructure.
- Site furnishings shall have an inviting outdoor living space with a range of settings to foster both individual and group interactions.
- The implementation of design solutions that can be constructed in a way as to allow the continued operation of activities in buildings outside of the construction area.

The proposed schedule includes seven months for design, three months for bidding, and four years of phased construction. Project delivery method will be Construction Manager at risk with completion of the project anticipated by August 2024. The design to construction budget is approximately $46 million. The university, with the design consultant, will evaluate project priorities of which tasks can be completed with the given design to budget; which items are add alternates and which items may be deferred to a future project.

SECTION 2
INSTRUCTIONS TO THE CONSULTANT

INTRODUCTION

The university requires innovation to provide the best economy in facility design, construction, and operation. The consultant will be responsible for recommending project phasing and alternatives to achieve cost efficiencies within established budget within each design phase. These recommendations should provide creative design solutions and should not result in reductions to the defined project scope of work or technical requirements.

ROLES AND RESPONSIBILITIES

Project Team

The University, the Architect, the Design Engineers and any other project consultants and the Construction Manager (CM) shall be called the "Project Team". It is the University's intent that the "Project Team" shall work from the beginning of this project through all phases of design and cost estimating and that the A/E shall provide leadership to the Project Team during the design phase.

The University shall designate a Project Manager who shall be the university contact point during the Programming and Design Phases. This representative shall be the primary channel of communication to the university and shall act as the university's liaison with the Project Team.

The university shall review all project documents at each design submittal (i.e. Schematic Design, Design Development, etc.); such review, however, will be made to insure that the intent of the Program and the Project Design Standards are maintained and that the university's comments have been incorporated as requested. The A/E is solely responsible for the content, accuracy and coordination of all documents.

The university shall be the principle reviewer and decision-making authority within the Project Team. In the event of any disagreement or dispute between any members of the Project Team regarding the project, the university shall be the final decision making authority.

The University is committed to a "Partnering" approach to the successful design and construction of its projects. The University defines partnering as collaboration among professionals (University, CM, A/E, and Trade Contractors) to maximize the success of a project while understanding and respecting the responsibilities and expertise of each team member. In light of this approach, the University may elect to conduct "Partnering" sessions on this project; a final determination will be made with the awarded A/E and CM firms.

GENERAL OVERVIEW

The consultant team should be comprised of professionals including architect(s), engineering disciplines and specialists that will provide specialized studies, architectural and engineering design, energy and life-cycle cost analyses, and the preparation of appropriate plans and specifications for each aspect of the work as described in this section and the complete program document.

The specific programmatic requirements and design criteria provided in this program are as complete and accurate as possible at this point in the project. It will be the responsibility of the consultant to conform to the requirements and criteria throughout the design process. Any changes to the program requirements must be requested of and approved by TU in writing.

CONSULTANT (ARCHITECTURAL/ENGINEERING) SERVICES & SCOPE OF WORK

The consultant will be required to work with a project management team comprised of representatives from TU's Department of Facilities Management, and others as required by TU. It is expected that the project management team would interact directly with the consultant and be active in the review, resolution and approval of all design work. The consultant services shall be provided in the following stages in accordance with *The University's Procedure Manual for Professional Architecture/Engineering Services of University of Maryland Projects, Towson University's Design Guidelines and Construction Standards 2017 (TUDGCS), Supplemental Requirements to the Procedure Manual for Professional Architectural/Engineering Services of University of Maryland Projects*.:

- Review of existing condition, program verification;
- Building condition assessments as noted;
- Schematic design;Design Development
- Construction documents: 50%,95%,100% submittal;
- Construction phasing coordination;
- Bidding of construction contract;
- Construction administration, including participation in commissioning;
- Completion and acceptance of project; and
- Post-construction (Record Drawings, Guarantee Period and LEED certification)

As a minimum, the following disciplines are expected for the consultant's team/staff:

- Civil Engineer
- Landscape Architect
- Architect including Envelope Consultant
- Structural Engineer
- Mechanical Engineer
- Electrical Engineer
- Independent Cost Estimator

TU intends to separately engage the services of a Construction Management (CM) at-risk firm. The university plans to secure the services of an independent Commissioning Agent for the project with the consultant participating in the commissioning activities during design, construction, and the post-construction period. A copy of the scope of work for developing a Commissioning Plan will be provided to the chosen consultant at the pre-fee negotiation meeting.

The consultant's scope of services shall be divided into specific phases including the General Design Requirements and Schematic Design Phase in accordance with the *Procedure Manual for Professional Architecture/Engineering Services of University of Maryland Projects*. It should also implement the building energy design standards pursuant to "Energy, Building Commissioning, and Maintenance Management Specifications" in this section.

The scope of work for the consultant involves not only general requirements but also code and building system requirements.

1. General Requirements

The consultant is responsible for:

- A/E design for options to reclad 4 residences tower facades, replace existing glazing system, replacement of utilites and PTAC units.

- Design plaza and entrance drive renovations for associated/needed site and utility improvements and entrance drive improvements for ADA and service access within the allocated budget. The facility design should address all the guidelines and comply with all requirements outlined in the Scope and Sections 3, 4 and 5 of this program. The facility design must be within the allocated budget and have add/alternates that can be added or deleted as the budget permits
- Issues of building, fire, public safety and security, and ADA regulations, ensuring that all solutions are integrated and coordinated to work together
- Studies to ensure the continued operation of facilities and roadways adjacent to the immediate construction area
- Project will involve phasing of towers and plaza. Preferred phasing is to vacate one tower at a time with plaza renovation as final phase.

2. Scope of Work

Site, Utilities and Infrastructure

- Investigate and repair utilities below grade between Tower B and dining hall.
- Design and replace storm water system surrounding buildings and plaza, evaluating and design for replacement the foundation drain system.
- Provide a loading dock and trash compactor drainage system to meet sanitary and stormwater requirements at each tower.
- Replace sanitary lines between towers and dining hall.
- Replace water supply mains between towers and dining.
- Replace waterproof monolithic membrane and substrate assembly at plaza, above dining hall.
- Evaluate and design slope of grade at towers, dining, and plaza to slope away from buildings. This includes existing to remain slab and pavers.
- Evaluate and retro–fit design current entrance drive for ADA parking spaces and emergency access from Cross Campus Blvd to Towers, dining, and plaza with particular attention to the loading and unloading logistics of student move-in and ADA access from entrance drive to plaza.
- Design service vehicle access to the buildings for the removal of trash and recyclables and the delivery/pickup of bulk materials. Provide screening at areas adjacent to public spaces.
- Replace/ repair (2) concrete stairs on north side of plaza, (1) concrete stair between Towers “A” and “B”.
- Development of the site design that provides an inviting outdoor living space to foster both group and individual settings.
- Provide university standard lighting, new pavers, green space, site furnishings and plantings for an inviting outdoor space.
- Provide appropriate exterior lighting to the building entrances and along all paths in accordance with Towson University standards.
- Site furnishings shall promote inviting outdoor living space with a range of settings to accommodate a variety of seating types. Provide for trach and recycle on plaza.
- Landscapes and planters shall include native, non-invasive plantings to compliment adjacent architecture.
- Provide locations for covered cycle shelter.
- Coordinate and provide for security camera infrastructure. Coordinate with TU Public Safety for camera locations.

Glen Towers A,B,C,D Improvements and Façade

- See Appendix 3 for 2013 Glen Towers Improvements Schematic Design narrative.
- Design replacement for the existing PTHP. The consultant shall also evaluate existing mechanical spaces in the building and make recommendations on the location and/or placement of equipment. Mechanical unit locations must not conflict with standard dormitory furniture configuration.
- Design for replacement for the existing PTHP with PTHP with supplemental electric heat. The consultant shall also evaluate existing mechanical spaces in the building and make recommendations on the location and/or placement of equipment. Mechanical unit locations must not conflict with standard dormitory furniture configuration.
- Where the HVAC work occurs, all abandoned systems/equipment must be removed including but not limited to PTHP, ventilator units, ductwork, drains, etc. including electrical services for such.
- HVAC controls shall be connected to the campus wide automatic temperature control system. Towson University campus standard control system is Automated Logic.
- The new PTHP units shall provide mechanical ventilation to the resident rooms. All other spaces shall be provided with mechanical ventilation either via a dedicated outdoor air unit or by direct outside air connection to the units serving these spaces.
- The existing sanitary risers shall be replaced.
- Evaluate rooftop ventilation and exhaust units.
- Evaluate for replacement Branch Circut Panelboards.
- Evaluate roof system for remaining serviceable life and compatibility with new rooftop equipment.
- Replace all of the exterior window assemblies for the entire building. All exterior building louvers should be redesigned and replaced to create a new and fresh appearance to the building.
- The design team shall design a complete comprehensive renovation of the exterior walls and envelope. Solutions should address issues with moisture and air infiltration, increasing insulation to improve R-values and energy efficiency, addressing any condensation issues, building aesthetics, and providing a new maintenance free exterior. A ventilated rain screen façade system applied to the existing exterior concrete should be considered as one possible solution.
- Design for new low slope roof canopies at tower building entries.
- Provide new interior finishes including flooring and paint at room where contruction has occured.
- Provide new interior window treatment per university standards.

3. Support Services/ Deliverables

a. The consultant shall submit to the university PDF files at each phase of design. TU utilizes Bluebeam software to review document. A/E shall utilize Bluebeam for document review. Provide one (1) complete set of CAD files for 50%, 95%, and 100% CD submission. During the project, the consultant may be required to submit draft electronic drawings as needed to support other campus initiatives.

b. Prepare renderings, diagrams, and other presentation materials to assist in university decision making. Provide a minimum of 5 exteriors renderings of proposed final design. Veiws shall be selected by TU.

c. Following TU's acceptance of the final design drawings and specifications, the consultant shall provide the university with:

- An electronic file copy of the specifications on the most current version of Microsoft Word;

- One electronic copy of drawing files in the most current version of AutoCAD comprising Architectural, Mechanical, Electrical, Plumbing, Structural, Site/Civil, Landscape Architecture and any specialty consultant's drawings and details, and
- Electronic PDF copy of all narrative, drawings and specifications.

d. Provide estimates and projections of all capital costs associated with the construction of the facility such as cost of new construction, equipment installation, utility extensions and site development at each submission (i.e., schematic and design development). All estimates shall be prepared and presented in CSI Division. Lump sums will not be acceptable. The selected consultant's independent estimator shall provide complete estimates concurrent with the submission of schematic, design development. CM estimate at 50% CDSs. The consultant will not proceed to the next design phase until the cost estimates are reconciled to the available budget and the construction management firm's estimates.

e. Identify and include methods of installation and connection with building utility services as well as the provision of necessary clearances for convenient, safe use and maintenance of equipment in the interior design documents. These documents shall be fully coordinated with architectural, mechanical, electrical, structural, plumbing (i.e., building systems) and all other pertinent documents.

f. Prepare all documentation and obtain approval of all permits and licenses as required, including but not limited to: Storm Water Management, Erosion and Sediment Control, State Fire Marshal's approvals for building fire protection and fire apparatus accessibility, Maryland Department of Environment (MDE) registration of new boilers and hot water boilers, and new electric and natural gas service connections with the local utility.

g. Incorporate the design of energy management, security and safety into the facility. The building automation controls, security and fire protection systems shall conform to those defined and adopted as standard systems by the university.

h. Telecommunication and data systems are an integral part of the facility, and the consultant shall coordinate with the university, including appropriate interfaces on and off campus in adherence to Towson University's *Computing and Network Services Cabling Specifications Design Guidelines and Construction Standards Manual.*

i. In the construction specifications, the consultant shall address the requirements of the contractor to provide detailed and comprehensive operations and maintenance manuals for all equipment and systems in an organized format. The selected consultant shall also stipulate the requirement for attic stock or spare parts allowances, e.g. carpet tiles, paint, plumbing fixtures, filters for air handling equipment, etc. *Towson University's Design Guidelines and Construction Standards* (*TUDGCS*) should be referenced for the items and information required.

j. During the first twelve months of the Post Construction Stage, extended consultant services will be required to review record documents and participate in any commissioning activities that extend beyond the occupancy date. The consultant shall include/provide at least two full team walk-through inspections at mutually established milestones and at one and two year intervals for warranty work.

4. Code Requirements

- Building Code: The consultant shall be responsible for developing the specifications and drawings to meet or exceed the requirements and regulations of the building code of the State of Maryland that impact the project, which includes the latest editions of the International Building Code (IBC) for Basic Building, Maryland Department of the Environment (MDE), Mechanical, and Energy Conservation Codes, the National Electrical Code, and ASHRAE standards, whether or not it is so defined or listed in the final construction documents. The consultant shall coordinate approval of all plans with the State of Maryland Fire Marshal. Early submissions of design documents or early review meeting(s) may be required.

- Persons with Disabilities: The consultant shall be responsive to federal and university requirements for barrier-free design according to all applicable laws, rules, regulations and codes in the preparation of all plans and specifications.
- Energy Consumption: The consultant shall follow design criteria and performance standards in accordance with the International Energy Conservation Code in the preparation of all energy analysis and calculations as well as plans and specifications.

ENERGY AND MAINTENANCE MANAGEMENT REQUIREMENTS

A. **General**

1. During all phases of design, construction and commissioning, the consultant shall comply with the requirements of this subsection to provide a safe, reliable, and economical building. To accomplish this, the consultant shall provide the required services to meet the building requirements over the life-cycle of the building.
2. The consultant shall employ at his/her expense (either in his/her own work force or as a consultant) competent registered engineers and architects for structural, mechanical, electrical, energy analysis and design work, and for any other major design portion of the work.
3. The consultant shall submit for approval to the university the name of an individual (either in his/her own work force or as a consultant) that will act as the Energy Analyst for the university's project. The Energy Analyst should have proven experience in energy design analysis and should be a registered engineer or architect. The role of the Energy Analyst will be to:
    - Coordinate disciplines within the consultant team to achieve the maximum potential energy efficient design
    - Review architectural, mechanical, and lighting submittals for compliance to energy guidelines prior to submission to TU
    - Serve as the primary contact point on energy-related matters with TU's Department of Facilities Management
    - Develop a building energy consumption model, perform energy analysis and assist TU in establishing a desired, achievable energy budget
    - Participate in the commissioning process

B. **Testing, Adjustment and Balancing**

The consultant shall incorporate the requirements of ANSI/ASHRAE 111-2013 (or its most current approved version) practices for measurement, testing, adjusting, and balancing of building heating, ventilation, air conditioning (HVAC), and refrigeration systems, into the construction specifications.

C. **Maintenance Management**

The consultant shall develop an equipment numbering scheme that is approved by the university and use this numbering scheme to identify the equipment on drawings, submittals, nameplates, and maintenance management forms. The consultant will include these comments in the specifications.

INFORMATION TO BE COLLECTED/DEVELOPED BY THE CONSULTANT

The consultant shall collect all required information from TU, local jurisdictions, and utilities owners and operators. Contracting with required support services, e.g. a surveyor, geo-technical services, etc., will be the responsibility of the consultant.

1. Existing plans, utility plans and site maps will be given to the consultant by the university. However, no assurances are given that these records are complete or accurate. It shall be the responsibility of the consultant to establish the precise location of all underground utilities and/or services in the construction area and show them in detail on the design drawings.

2. Field Investigation Requirements: Existing drawings, whether "as built" or construction drawings, should only be used as a guide/reference tool and under no circumstances be construed as accurate. The selected consultant is required to examine existing drawings, order test borings, test pits, ground penetrating radar tests, infrared tests, electrical load tests and any other means necessary to ensure accuracy for the design.

3. Benchmarks: The consultant, with the approval of the university, shall establish a sufficient benchmark for the development of the contract documents.

4. Test Holes: When there is doubt as to the actual location of any existing utility or there is the possibility of interfacing with the alignments of new or existing utilities, and if such information is deemed necessary to prepare an accurate design, the selected consultant will make test holes either by performing the work or contracting for the work after the approval of the university. It will be the responsibility of the consultant to inform Towson University of the quantity and location of test holes required and field check the utilities after the test holes are open.

5. Survey: The consultant shall prepare a survey that documents all existing conditions of the site and confirm all information provided by the university. The extent of the information and work required by the survey shall include, but not be limited to: all existing topography, utilities, roads and improvements, significant vegetation and natural features, existing utilities, boundaries, easements and any legal restrictions that apply.

6. Outages: All outages anticipated during any investigative work (utilities, roadways, parking, etc.) must be coordinated through the Department of Facilities Management. Once the best window of opportunity for an outage has been established, a minimum of ten (10) workdays advance notice is required prior to all outages.

SECTION 3
SITE DEVELOPMENT CRITERIA

INTRODUCTION

The purpose of this section is to provide a basic outline of site issues, assets and project requirements for the consultant. The information provided in this section is intended to supplement the consultant's own site evaluation.

The consultant is responsible for the design of all areas within the project's site limits, or its "footprint", in addition to the utility infrastructure requirements; service and parking requirements; circulation; storm water management, open space requirements; exterior furniture including but not limited to benches, trash receptacles, recycling receptacles, tables with umbrellas and covered bicycle racks; special constraints or other required services. A project site boundaries map has been included. Imaginative and responsible solutions must be developed to form a cohesive, unified, economical, and aesthetic design solution that is consistent with and advances the ***Campus Master Plan,*** 2015. The critical areas to be addressed include the following:

Requirements:

- On-site and connection to campus pedestrian circulation
- Vehicular circulation and access
- Accessibility for people with disabilities
- Service areas and their access
- Circulation to parking areas
- Passenger drop-off areas and pedestrian walkways
- Common open spaces, courtyards, plazas and landscape buffers
- Emergency apparatus access
- Integration with other major capital projects

Special Constraints and Requirements

- Utility infrastructure requirements
- Integration with other major capital projects
- Environmental regulations (Storm Water Management, Erosion and Sediment Control, etc.)
- Design conforming to Crime Prevention through Environmental Design Standards
- Continuous operation of adjacent campus buildings, parking lots, etc.

LAND DEVELOPMENT

A location map is included showing the site. In addition, the university will make available its electronic base map, in AutoCAD format, that includes contours created from aerial photography, along with the general location of underground utilities and surface-built and landscape features as a starting point for the design team.

LANDFORMS

Topography/Soils

Topography is an important element in the utilization of the site and critical to development decisions. Careful consideration of the site character is required in the development of the site and the determination, of the building's "footprint" and placement. Topographical features should be integrated with facility orientation and function is required. Utilization of advantageous landforms and avoidance of undesirable site features should be incorporated into the design solution.

The consultant shall contract for the services of a licensed geotechnical engineer to assess existing soil stability and sub-structural bearing capacity. A geotechnical assessment report shall be prepared to establish required foundations, pavement structure and retaining systems.

Landforms and Vegetation
Vegetation is vital to the character, micro-climate and aesthetic quality of the site. The site development and building design solutions should respect vegetation as a potential design element. Plantings of various types and textures buffer sounds, noises, and odors as well as moderate sun, wind and precipitation. Vegetation and landscape features should have climatic, aesthetic, privacy, safety and security purpose and relate to the prescribed functions of the facility. Design should employ hardy indigenous plant materials and require minimal maintenance.

Although site work will be required to complete the project, care should be given to existing vegetation. Existing vegetation should be maintained wherever possible.

When determining the locations, disposition and types of plantings, the consultant should consider campus security standards and the principles of crime prevention through environmental design. Particular attention should be given to edges of woodlands, public areas, pathways and the perimeter of buildings. These considerations are especially necessary in consideration of the type of facility being designed.

Plantings
Plant species selection and planting layout must be designed for aesthetic consideration throughout the year and compatibility with both building design and campus ecological goals. Ground cover, flowering plants and shrubs should have limited use in conformance with the *TUDGCS*. Planting beds should not inhibit access to open space, create security issues or excessive maintenance requirements, and should be used in conjunction with the requirements of storm water management. Special consideration should be given to the use of native plants.

Hardscape
Hardscape, including pedestrian paths, roadways, drivable paths and entry plazas must be designed in accordance with the *TUDGCS*. Pathway organization, orientation and design must be considered in conjunction with the overall pedestrian network on campus and projected in the Campus Master Plan. The specific patterns, materials, widths and construction of pathways should be derived from the design of the Campus Site and Safety Improvements project.

Site Furnishings
Site furnishings, including trash and recycling receptacles, benches, bike racks and site lighting shall be selected and sited consistently with the *TUDGCS* and the conceptual site plan.

Site Lighting and Security Improvements
Exterior lighting shall be in accordance with the *TUDGCS*. Overall design should limit the amount of light transmission off site and into the atmosphere. Lighting shall comply with the Illuminating Engineers Society of North America Standards and follow LEED recommendations.

CIRCULATION

Pedestrian Access
Pedestrian safety is a major consideration for site development. Pedestrian circulation shall be maintained for the duration of the project and not separated from conflicts with vehicles.

SERVICE AND FUNCTIONAL ORGANIZATION

Building service areas are an integral function of the building operations, but must be screened to prevent visual, impositions and adverse auditory impacts. The consultant shall design the service functions to prevent incompatibilities with on-site activity.

Access requirements for fire apparatus shall be provided for in compliance with standards established by the university and the Fire Marshall. The consultant shall coordinate the review of proposed site plans for compliance with all agencies having jurisdiction.

ACCESSIBILITY FOR INDIVIDUALS WITH DISABILITIES

This section aims to supplement the *TUDGCS* information with an outline of considerations relating to the site usage of physically disabled individuals in order to ensure full compliance with ADA. It is imperative that the consultant considers means of travel from any given location to multiple destinations within the site without going through any part of the proposed building. All major entrances to the building must be accessible to people with disabilities. This includes the provision of curb cuts and the elimination of excessive grades and handrails within ADA design regulations guidelines for accessibility.

The use of exterior ramps is discouraged and should only be considered where physically required. Whenever possible, minimize walkways to 5% grade change to eliminate the need for railings. However, when ramps are required and exceed 5% grade, every effort should be made to minimize sight of the required railings.

Innovative design will be needed to attain total accessibility, especially in light of the programmed facilities. The term "people with disabilities" extends beyond those who are permanently disabled to include temporarily disabled and non-ambulatory individuals, a common occurrence on a campus of physically active young people.

In general, it may be stated that accessibility to this facility should be integrated into the overall design concept creating a barrier-free environment that accommodates everyone. The following are to be incorporated in the project design:

Entries
Major points of entry to the building must facilitate access for the disabled and include electronic door-opening devices at all entrances. In all cases, points of entry to accessible parking must be designed to permit accessibility by people with disabilities. Ramps or other special features are to be integrated into the total design so as not to appear as a special conciliatory feature. ADA paths should be designed such that handrails are not required wherever possible.

Graphics
A graphic system must be included in the site design to indicate parking spaces and to direct people with disabilities to accessible building entrances. Signage must comply with Wayfinding Standards, *TUDGCS* and ADA criteria.

UTILITIES

The project includes the complete design of all utility extensions/upgrades (storm water, domestic water, electric, lighting, gas, sanitary sewer, telecom, data, etc.) within the plaza to the points of connection. Some relocation of existing utilities may be necessary. This is understood to include an evaluation and confirmation of all on-site utilities that will be affected by these upgrades.

STORM WATER MANAGEMENT (SWM) AND SEDIMENT AND EROSION CONTROL

Storm water management on the site should meet the requirements of the Maryland Model Storm Water Ordinance and Maryland Storm Water Design Manual Volumes I & II. The consultant shall submit plans for storm water management (or submit an application for storm water management waiver) and sediment and erosion control for approval to the Maryland Department of the Environment (MDE), Sediment and Storm Water Administration at 2500 Broening Highway in Baltimore, Maryland.

Quantitative and qualitative storm water management, as required by the Maryland Department of the Environment, shall be included in the site drainage design. Storm Water Management (SWM) must be addressed on a project if more than 5,000 square feet of surface area is disturbed.

Furthermore, early coordination with the reviewing agency (MDE) is essential to preclude delays. A site/grading plan with erosion and sediment control plan and supporting calculations must be submitted during or immediately following the Design Development submittal stage. The consultant will be responsible for obtaining all MDE permits in order to maintain the project schedule.

Erosion and sediment control practices shall conform with the most recent Maryland Standards and Specifications for Soil Erosion and Sediment Control published jointly by Water Resources Administration, Soil Conservation Service, and State Soil Conservation Committee. Sediment and erosion control must be approved by the MDE if more than 5,000 square feet of surface area or more than 100 cubic yards is disturbed.

Drainage

Drainage patterns around structures shall be directed away from existing and proposed structures, pedestrian and vehicular paths, and parking areas to prevent interference with their functioning. Catch basins, storm sewers, and drainage ways shall be designed in compliance with Maryland Department of the Environment regulations and standards.

The selected consultant shall survey existing storm sewers that service the site to confirm feasibility of connection to the existing sewers to assure discharge of runoff.

CONSTRUCTION ACTIVITY POLLUTION PREVENTION

Pollution from construction activities should be minimized by controlling soil erosion, waterway sedimentation, and airborne dust generation. The consultant shall create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local standards and codes, whichever is more stringent. The plan must describe the measures implemented to accomplish the following objectives:

- To prevent loss of soil during construction by storm water runoff and/or wind erosion including protecting topsoil by stockpiling for reuse;
- To prevent sedimentation of storm sewers or receiving streams;
- To prevent pollution of the air with dust and particulate matter.

The EPA's construction general permit outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the permit only applies to construction sites greater than 1 acre, the requirements are applied to all projects for the purposes of obtaining the LEED BD+C Construction Activity Pollution Prevention credit.

Construction Waste Management

To divert construction and demolition debris from disposal in landfills and incineration facilities, a construction waste management plan must be developed and implemented that identifies materials to be diverted from disposal. At least 50% of the construction debris must be recycled per the requirement of LEED BD+C, Construction Waste Management. The university requires that wood, concrete, asphalt, glass, carpet, and metals be recycled and reported to Facilities Management.

SECTION 4
BUILDING DESIGN CRITERIA

INTRODUCTION

The primary criterion governing design shall be one that produces an optimal solution to the stated requirements within budgetary limitations. A functional, pleasing, energy efficient, sustainable, and economical facility, both internally and externally, is a major goal in the design and completion of this project. Building design solutions must address the functions and spaces detailed in this program, site environmental opportunities and constraints, energy conservation, safety and security, and life-cycle costs.

The current edition of *Towson University's Design Guidelines and Construction Standards* (*TUDGCS*) is hereby made a part of this document. The consultant should become familiar with the *TUDGCS* and use it as a reference and base for project design. Where a conflict arises between the consultant's requirements for design and the *TUDGCS*, the consultant is obligated to resolve the conflict with input from and approval by the university. The following sections detail considerations that must be incorporated into the final project design.

EXTERIOR ARCHITECTURAL EXPRESSIONS AND DETAILS

This project is intended to compliment and relate to the existing surroundings and to improve the conditions the Glen Complex. Take into account sight lines, solar orientation and reflectivity of the surrounding buildings. Materials shall be tried, proven, low-maintenance items with service expectancy of at least forty years that are compatible with the TUDGCS and TU Master Plan. Local (within 500 miles) and sustainable materials are preferred.

- **Communication of building information through signage and graphics is essential.** It is the consultant's responsibility to design an identification and directional system to communicate information essential to the operation of the new facility. The interior/exterior graphic system shall assist individuals moving to and within the facility. In accordance with ADA requirements, particular attention must be given to the needs of individuals with disabilities to access the building from parking areas and walkways and to move freely throughout the building. The graphic system must be consistent with *TUDGCS*. Please refer to the TU Interior Sign Program and coordinate with the Office of Technology services for interior electronic signage.

Fire and life safety issues are major design considerations. The consultant must investigate all potential fire and life safety problem areas, including those that may be generated by the program requirements. Below is a partial list of requirements:

- All fire equipment is to be clearly visible and graphically designated.
- All materials used in the building are to be selected with regard to flammability contents and the types of gasses produced by combustion.
- Emergency access and egress routes are to be clearly identified and physically apparent to the building occupants.
- Where emergency egress routes do not exist to grade, provide for areas of refuge assistance.

TU's Department of Environmental Health and Safety (EHS) is responsible for inspection and evaluation of safety-related problems on the campus. This department is staffed with professionals trained in various aspects of fire, life safety, hazardous materials, and occupational safety and bio-hazards. Campus criteria for installation of fire alarm systems, extinguisher cabinets, sprinkler systems, fire lanes and ventilation are as set forth in the *TUDGCS* and various codes.

All fire and life safety alarm system designs must be approved by the Maryland State Fire Marshall prior to installation.

Maintenance costs associated with new construction must be a consideration in the design of systems. Life-cycle studies have shown that the cost of maintaining a building over its normal life exceeds the capital cost of constructing that facility. The consultant is expected to play a major role in minimizing maintenance problems by obtaining input from TU in locating facilities, designing and laying out building systems, selecting equipment and finish materials, and designing other areas that directly affect annual maintenance costs. TU will approve the systems design and equipment and material selection. Considering the project's available resources (budget, space, etc.), the consultant will recommend the best available equipment, but not equipment soon to be obsolete. Some specific requirements the consultant must meet when designing the facility are:

The consultant will be responsible for ensuring accessibility to equipment for its maintenance, repair, removal and replacement with minimal effort.

MECHANICAL AND PLUMBING DESIGN CRITERIA

The consultant shall coordinate the design of all elements of the building to meet the requirements of function, energy and aesthetics. The design shall comply with all applicable codes, standards, good engineering practices and the *TUDGCS*. During the early part of design (Pre-Schematics), input from all of the members of the design team is required regarding structural types, day-lighting, equipment location, and building materials to be selected so that they flow smoothly into the other design phases of the project and not create roadblocks that would interfere with the International Energy Conservation Code compliance or LEED Certification. Where more than one solution to a design problem may seem appropriate, the consultant must perform life-cycle cost and operating comparisons to determine the optimal solution.

In general, the work must be designed to provide maximum reliability. This may require the use of standard equipment or alternate modes of operation for critical systems or equipment. The requirement for reliability also includes the avoidance of systems or equipment for which there is inadequate history of satisfactory performance. In addition, the work must be designed to be readily maintainable. Adequate clearances for servicing must be provided for all operating equipment. No operating equipment shall be located above ceilings unless specifically designed for above ceiling applications.

Water conserving designs and fixtures are important. The consultant shall employ low-flow faucets, low-flow toilets, waterless urinals should be evaluated for use and discussed with the university prior to final specification, and automated faucet controls for all public water fixtures. Consultant should follow recommendations provided by LEED on water efficiency.

ELECTRICAL DESIGN CRITERIA

Electrical systems shall comply with all applicable codes, standards, and good engineering practices and the TUDGCS. The building shall be designed with provisions for lighting, emergency, receptacle and HVAC power and life safety. All lighting shall have high efficiency lamps and ballasts.

OPERATION, MAINTENANCE, INSTRUCTIONAL MANUALS AND SPARE PARTS

Five copies of suitable manuals must be furnished with the equipment and systems designed and constructed. The following are minimum requirements:

- Manufacturer's catalog descriptions of specific equipment items;

- Manufacturer's operating and maintenance instructions;
- Wiring diagrams for inter- and intra- connections of components;
- Schematics and location drawings of components and systems with "troubleshooting" guidance; and
- Component breakout lists for ordering replacement parts, etc.

Operations and Maintenance Manuals shall be provided to the TU Department of Facilities Management two weeks in advance of any testing or commissioning of any equipment.

GLEN COMPLEX

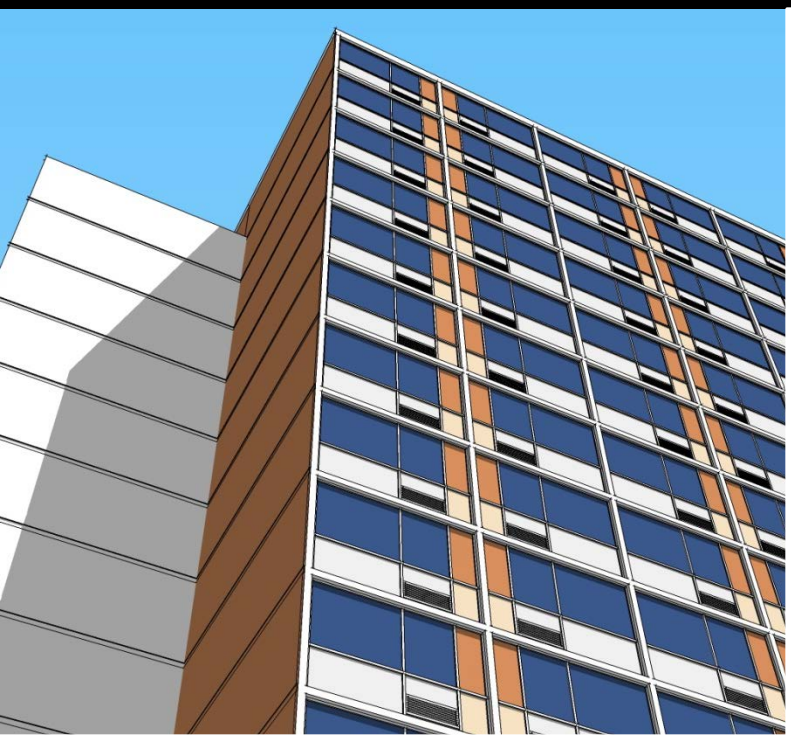
TOWSON UNIVERSITY

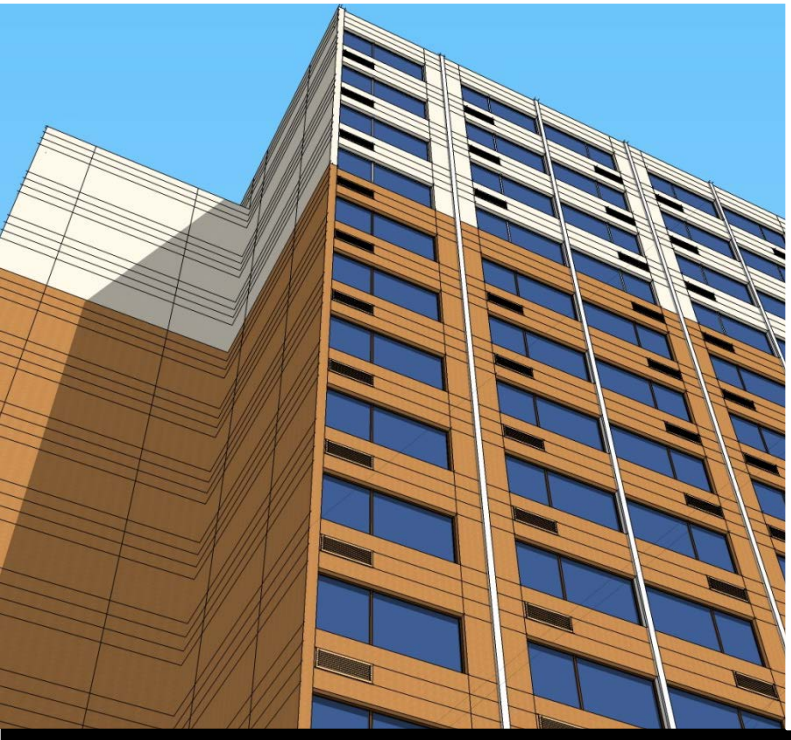
DRAWN BY: L.D.S.

DATE: 08/25/16

SCALE:

Glen Towers - Façade Improvements
Towson University





July 2, 2014

Narrative

INTRODUCTION

Figure 1 – Aerial Plan View / Glen Complex

The Glen Complex Residences were constructed in 1983 on the campus of Towson University. The four high rise residence halls are located along the north side of Cross Campus Drive (see Figure 1). The towers vary in height:

Tower A: 16 stories
Tower B: 15 stories
Tower C: 14 stories
Tower D: 15 stories

Three of the towers, B, C and D, form a plaza with a dining facility in the center. All three of these residence hall entrances face the dining facility. Forming the south edge of the plaza, Tower C shades the plaza, as well as parts of Towers B and D, throughout the day. Tower A sits to the west of the plaza with its entrance facing north as shown in Figure 1.

All four towers utilize a cast-in-place structural concrete frame, with slabs and wall edges expressed on the exterior window walls. The concrete frame is infilled with a 8’-0” high x 12’-0” wide modular aluminum

storefront system as shown in Figure 2 below. Each tower's façade combines these modules for window walls comprised of either six-bays or two-bays.

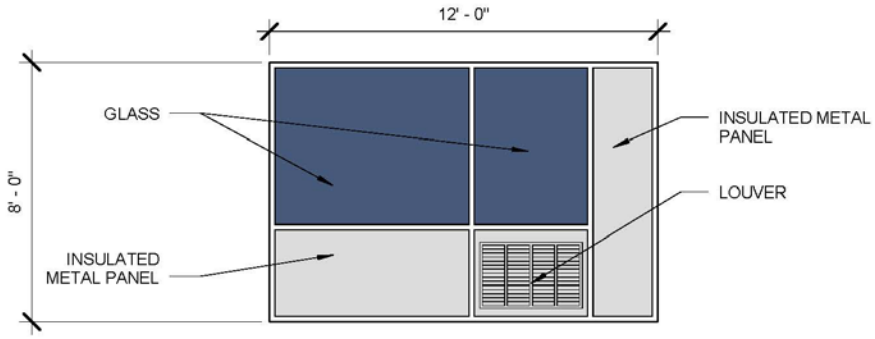


Figure 2 – Elevation of existing aluminum storefront module

The recessed corner walls were constructed with textured wall panels. Untreated, these concrete surfaces are susceptible to soaking and staining during heavy rains as shown in Figure 3 below.

Figure 3 – Concrete staining from rain

In 2010, a *Façade Restoration Study* for Glen Complex Tower A concluded that areas of the exposed concrete facade showed cracking and spalling, delaminated parging, and water infiltration. Of particular concern was the "fact that concrete fragments have come loose and fallen in areas of heavy pedestrian traffic below the building." Another long term concern includes the spalling concrete's ability to protect the steel reinforcing from corrosion.

The University has patched several areas of the exposed concrete based on the Tower A study, but these repairs are projected to stabilize the concrete for only ten years. Leaving the concrete exposed will be a recurring maintenance cost and safety concern.

The 2010 study (p. 6) also proposed a longer term solution:

> *"The most numerous and severe areas of material deterioration are located on the four window walls. Installation of a new curtainwall system, attached to the face of each window wall, is presented as a longer term repair option. Installation of a new metal wall panel system, on the concrete corner walls, is presented as a supplemental option.*
>
> *If both options were implemented, the concrete building would be entirely encased, which would improve the thermal envelope, reduce building maintenance, and eliminate the life safety concerns from falling debris."*

ROOM LAYOUT

Each residence hall room typically houses two students who share a bathroom unit with another room. The typical room layout has a closet, packaged terminal air conditioner (PTAC), and a bed along its outside wall (see Figure 4 below). The closet is doorless and enclosed by drawn curtains. All of the proposed schemes retain this existing layout.

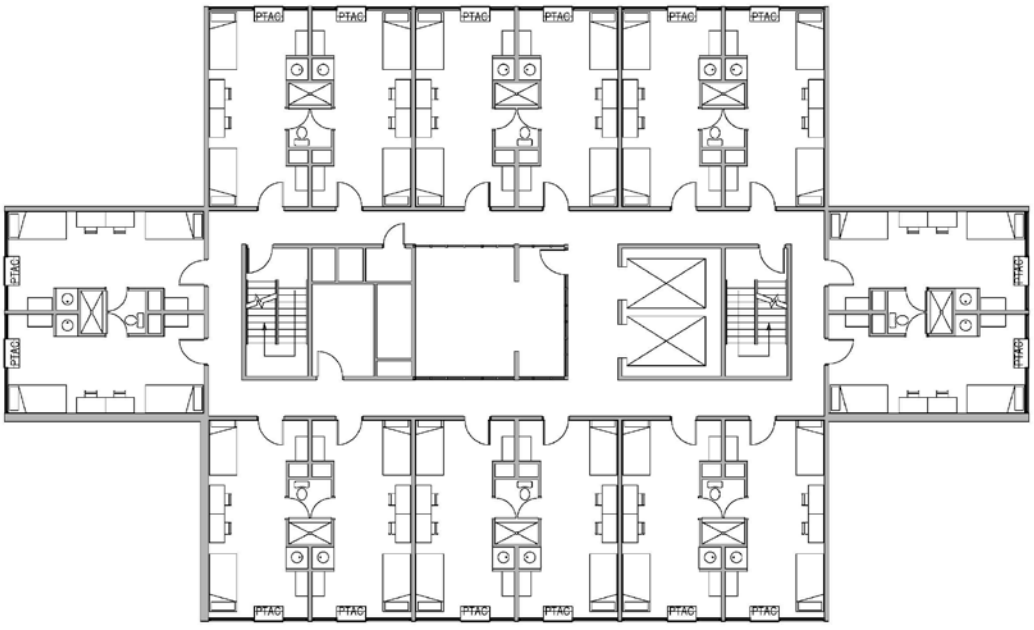


Figure 4- Typical Floor Plan

SURVEY OF EXISTING FACADES

The design team conducted a survey of the exposed concrete surfaces for each tower at the Glen Complex.

The data was obtained by means of laser scanning in conjunction with conventional surveying equipment. A *Leica MS-50* multistation was used to obtain the scan data. The *Leica TS-12* total station and *CS-15* field controller were used to obtain data in areas obscured at the time of the scan. Importation of the scan data was performed using *Leica Cyclone* and both the scan and conventional data were viewed and analyzed using *AutoCAD Civil3D 2013* in conjunction with *Leica Multiworx* plug-in software.

Variations in the vertical concrete surfaces range from 1.0” up to 3.2” on one façade.

The survey drawings are included at the end of this document. Maximum variations for each tower facade are summarized below in inches:

Tower A: North 3.0”/ West 1.0”/ South 3.0”/ East 2.5”

Tower B: North 1.5”/ West 1.7”/ South 3.2”/ East 2.3”

Tower C: North 2.5”/ West 1.0”/ South 3.0”/ East 2.3”

Tower D: North 2.4”/ West 1.7”/ South 2.0”/ East 1.9”

The faces of the concrete slabs at each level were also surveyed. Variations along a floor slab edge range from 0.25” to 1.5”. Maximum variations of the exposed floor slab edges are summarized below in inches:

Tower A: North 0.75”/ West 0.5”/ South 0.5”/ East 1.5”

Tower B: North 0.25”/ West 1.5”/ South 0.25”/ East 0.75”

Tower C: North 0.5”/ West 0.5”/ South 1.0”/ East 1.0”

Tower D: North 0.5”/ West 1.0”/ South 0.5”/ East 1.0”

ARCHITECTURE

Façade improvement designs for the Glen Towers buildings include the following criteria: protecting the exposed concrete frame, updating the existing storefront system with either a glazed storefront, curtain wall system, or a rainscreen system, and increasing the window wall's thermal performance.

All of the options retain the existing residence hall room layouts, closets and PTAC locations.

The larger exposed concrete surfaces on the side elevations could be painted and sealed with a modified waterborne acrylate, such as Tnemec *Enviro-crete 156 + 157*, or clad in a rainscreen material such as a Centria *Formabond* Metal Composite Wall System. The acrylate finishes are warrantied for 10 years and would require maintenance or re-application, while the metal paneling is warrantied for 20 years.

The side elevation colors could alternate between towers and could incorporate text or graphics for each tower as shown later in the design schemes. Product information for all materials discussed and precedents are included at the end of this document.

The stair walls and elevator shaft cores protruding above the main roofs could also be finished with a modified waterborne acrylate or clad in metal panel as well.

In all of the design options, the front entrance canopies would be integrated into the overall design of each building's facades. From the third floor and up, the typical floor to floor heights are 8'-6". However, from levels One to Two and levels Two to Three, the floor to floor heights are 9'-6". A metal fascia could be integrated into the additional 12" at the two lower floors allowing for connections to entrance canopies at the second or third floor slab, while maintaining an 8'-6" typical storefront bay height.

PTAC units with 42" x 16" louvers are also integrated into the elevations. These units are discussed in further detail in the *Mechanical Systems* section of this document.

Figure 5 – Existing Tower "D" Façade with Six Bay Entrance Window Wall

Glazing Options

The basis of design for the energy modeling's glazing is 1" clear insulated with low-E coating, PPG *Solarban 60 (2) Clear + Clear* with a Solar Heat Gain Coefficient (SHGC) of 0.38. An energy analysis is discussed in further detail in the Mechanical Systems section of this document.

An alternative is to apply a solar control window film, such as Hüper Optik's *Ceramic 30* film, to the interior face of 1" clear insulated glass. This application carries an SHGC of 0.37. Since it is applied to glass surface *4* as shown in *Figure 6* below (indicated in red), there may be concerns about the film's long term maintenance.

For the aluminum storefront or curtain wall alternatives, insulated metal panels would be used at the opaque surfaces below the sills and at the closets.

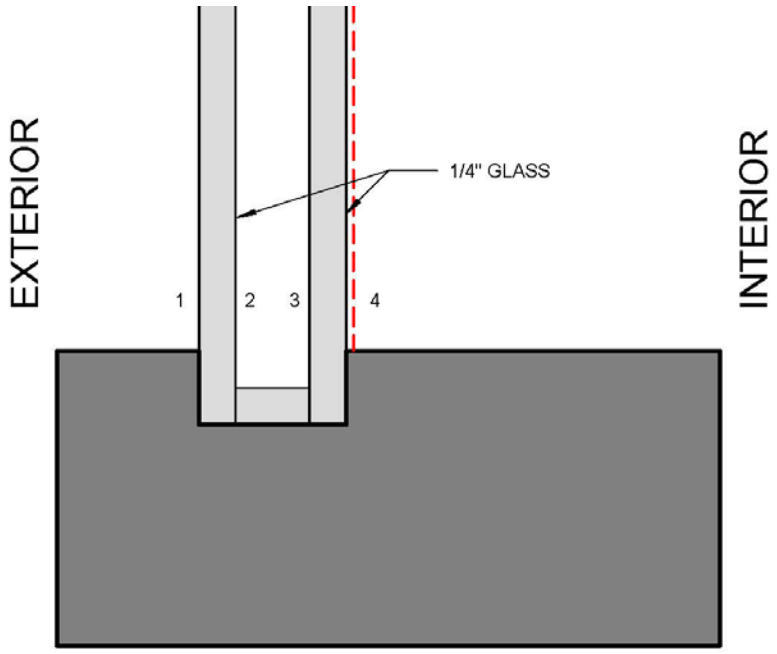


Figure 6 – Window sill detail showing glazing surfaces

Canopy

The 1980 as-constructed drawings did not show canopies at the building entrances. The existing canopies were constructed to serve as protection for pedestrians from the loose concrete dropping from the towers' window walls. The gable forms currently cover the exhaust louvers for the second floor PTACs.

New canopies would be flat (low-slope) roof with a membrane such as EPDM or TPO with a slimmer horizontal profile (see Figure 7) so as not to obstruct PTAC exhaust louvers. Canopies would be constructed with steel frame and steel deck, and finished with a metal fascia.

Downspouts could be located at the rear posts. Wall sections are provided with each scheme showing where canopies could attach to the building.

Figure 7 – Entrance Canopy

PHASING

Based on discussions with representatives from Towson University, construction managers, curtain wall installers, and rain screen installers, several different phasing alternatives have been considered for the construction of façade improvements at the Glen Towers Complex. The alternatives range from construction in fully occupied buildings to completely vacating multiple buildings at one time, and vary in construction time from 2 years to nearly 8 years. Given that Towson University has expressed a preference toward minimizing vacancies at the Glen Towers Complex as much as possible, the design team has focused on phasing alternatives that achieve the shortest period of construction and the least amount of time with vacant rooms in the buildings.

There are several areas of consideration or concern worth noting that are relevant to all considered alternatives if construction occurs in partially or fully occupied buildings including:

- Construction activity inside or outside of an occupied building with student residents present increases the liabilities and costs for both the contractor and University relative to potential conflicts between students and construction workers.
- Privacy screening will likely be needed at windows during construction for any occupied residential spaces. This will impact the student's ability to see out through the windows.
- Noise and disruptions for students are likely during construction hours, especially in alternatives that include construction activities on occupied buildings.
- Separate means of egress will need to be maintained for students and construction workers. This is potentially complicated if buildings will be fully or partially occupied during construction.
- Work on the interior of the building would be limited to summer and winter breaks, with exterior work scheduled during the spring and fall semesters in any building fully or partially occupied.
- Careful coordination will be required between Towson University and the Construction Manager to determine the right time in the construction schedule to remove the existing exterior glazing system and the existing PTAC units in order to limit the impacts to building residents.
- Phasing alternatives allowing for partial occupancy would require coordination with the Construction Manager to determine the most effective approach. Consideration has been given to work on two (of four) building facades simultaneously, or one half of the buildings levels (lower half/upper half). These options can be seen in Figures 8a and 8b.
- A partially occupied phasing alternative will require that vacated students be relocated across the other towers, or other residential alternatives at Towson University.

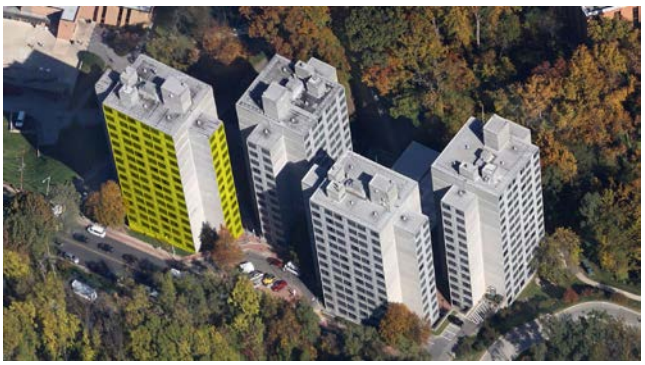


Figure 8a – Example of Partially Occupied Tower Phasing

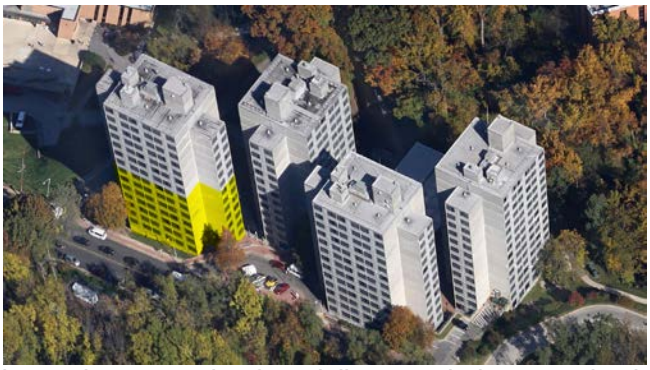


Figure 8b – Example of Partially Occupied Tower Phasing

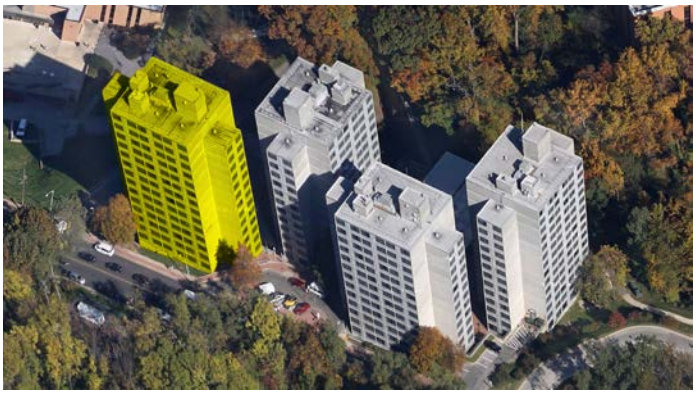


Figure 9 – Vacant Tower

Preferred Phasing Alternative: Vacant Tower (see Figure 9)
Duration of Construction: 4 Towers in Approximately 2.5 Years (1 Tower per 8 months)

Considering all of the discussion as well as the items noted above, the preferred phasing alternative is to vacate one tower at a time for one semester (spring or fall) and one break (summer or winter) (approximately 7-8 months). Residents would vacate a tower at the conclusion of a semester and demolition/construction would continue through the following semester and break. Similar to the partially vacant tower phasing alternatives, this option would temporarily redistribute students across the other 3 towers or other residence halls on the campus.

With this alternative, preparation could begin in the semester prior to actual construction activities. Students would be vacated from a building following the spring or fall semester, and demolition/construction activities would begin immediately with the goal of completing the construction on that building prior to students moving back in for the following spring or fall semester (approximately 7-8 months later). This approach allows for demolition/construction to begin on a second tower during the following winter or summer break with work continuing through the next semester, essentially allowing construction to be completed on two buildings in one calendar year. Please refer to Figure 10 and Figure 11 for the potential phasing schedule depending on whether construction would begin following the spring or the fall semester.

Based on our conversations with installers and a construction manager, this schedule would be aggressive, but feasible. It would allow for one to two months for demolition and initial framing, six

months for erecting the four curtain wall or rainscreen façades, and one month for project closeout activities. Reinstallation of furniture into residential rooms by Towson University would likely need to overlap the construction closeout activities for each building. Significant preparation would be required prior to beginning any construction activity on each building.

Other potential considerations for this phasing alternative include:

- Should the contractor determine that it's feasible to unitize the cladding system, on site construction may be expedited with assembly of the unitized components occurring off site.
- It is possible that installation of scaffolding could begin on a tower prior to vacating the residents, should the contractor choose to scaffold as opposed to using lifts.
- Cladding construction activities at the predominantly concrete inside corners could take place independently of the work associated with the glazed facades, allowing further flexibility for scheduling.
- Vacating an entire tower also provides scheduling flexibility by allowing the contractor to work on multiple parts of the building simultaneously including different facades, as well as interior and exterior work.
- Privacy and noise concerns for residents in adjacent buildings should still be considered while construction activity is occurring on an adjacent tower.
- Overlapping construction activities on two towers does carry a substantial risk. Should weather or unforeseen conditions result in a missed schedule for completion of one tower while a second tower has already begun demolition/construction activities, the University could be left in a situation with two towers vacant for the period of time necessary to complete the first tower and to move students back into the building.

Design Option A: Storefront Infill

This option replaces the existing storefront units with a new aluminum storefront system in the same vertical plane, slightly recessed from the face of the exposed concrete frame, as they were at each room.

Metal panel would clad the exposed concrete frame with a series of metal clips attached to the concrete frame.

The proportion of clear glass to spandrel is similar to the existing window system, keeping sills and window heads in the same elevations, while providing spandrel at the closet locations. This option retains the original tower facades' major vertical and horizontal lines/proportions.

A new PTAC unit would sit in the same location as the existing PTAC unit.

Relative to the other schemes, this option is the least expensive and protects the exposed concrete surfaces. However, it also offers the least flexibility in re-proportioning the facades, and will require maintenance of sealed joints similar to current levels.

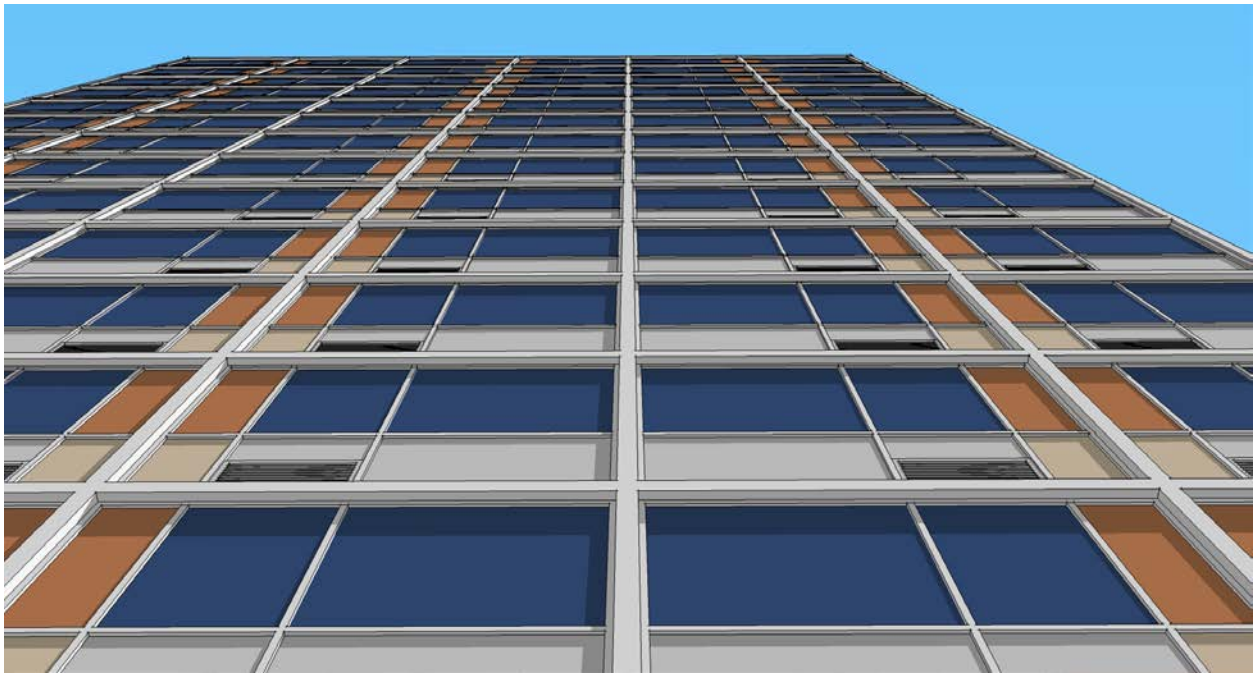


Figure 11 – Scheme A Façade - Storefront

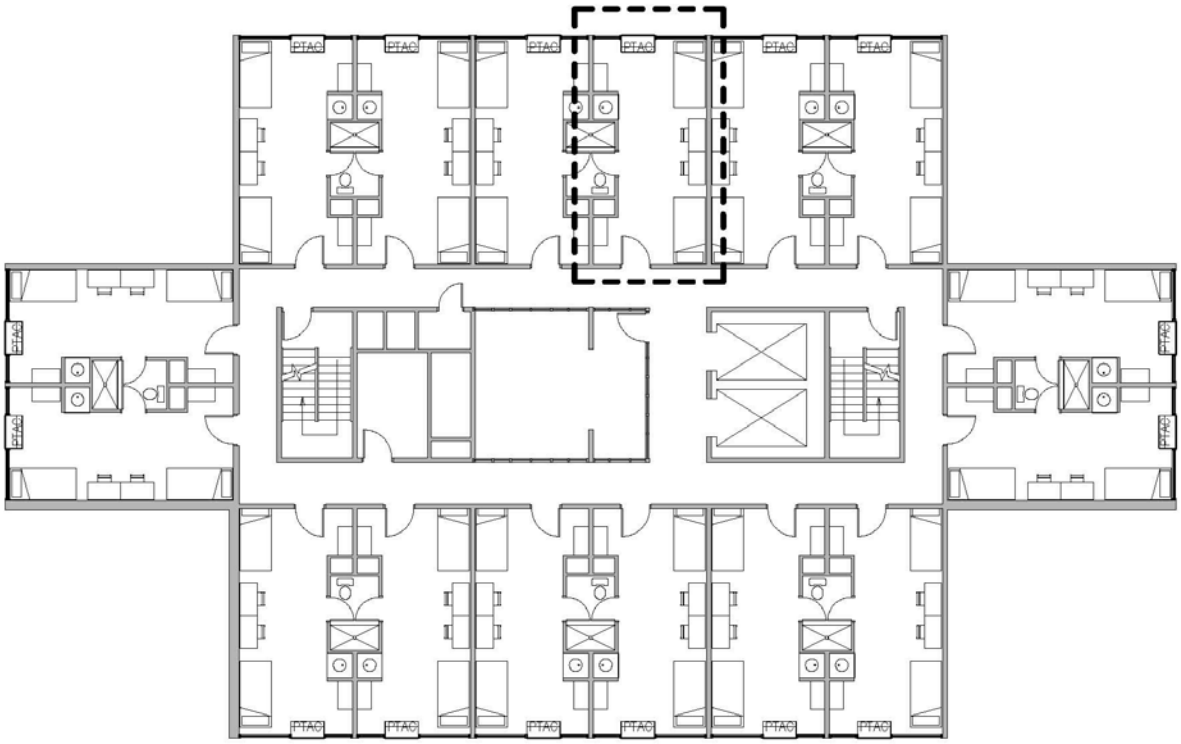


Figure 12 – Typical Floor Plan

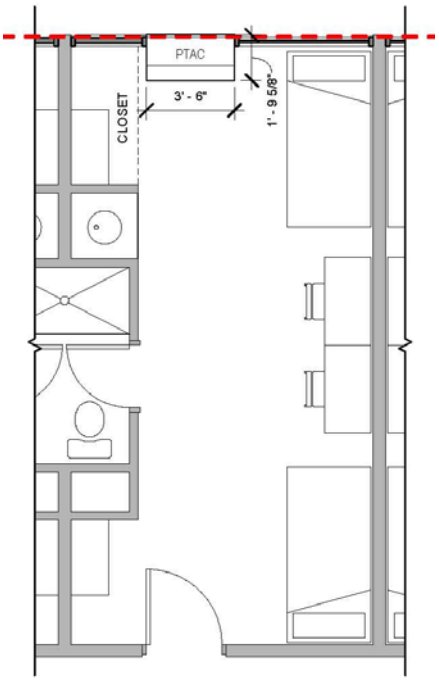
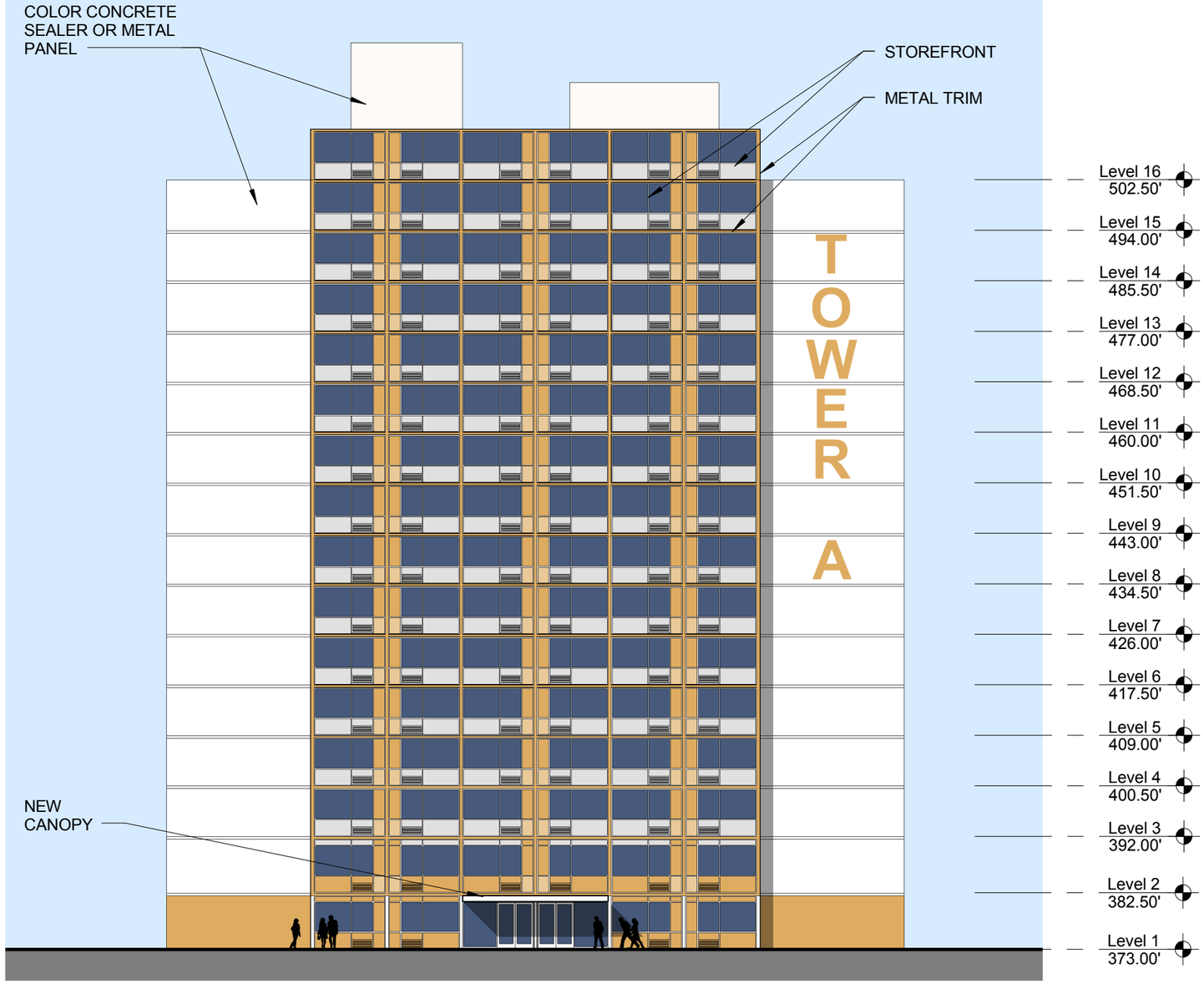
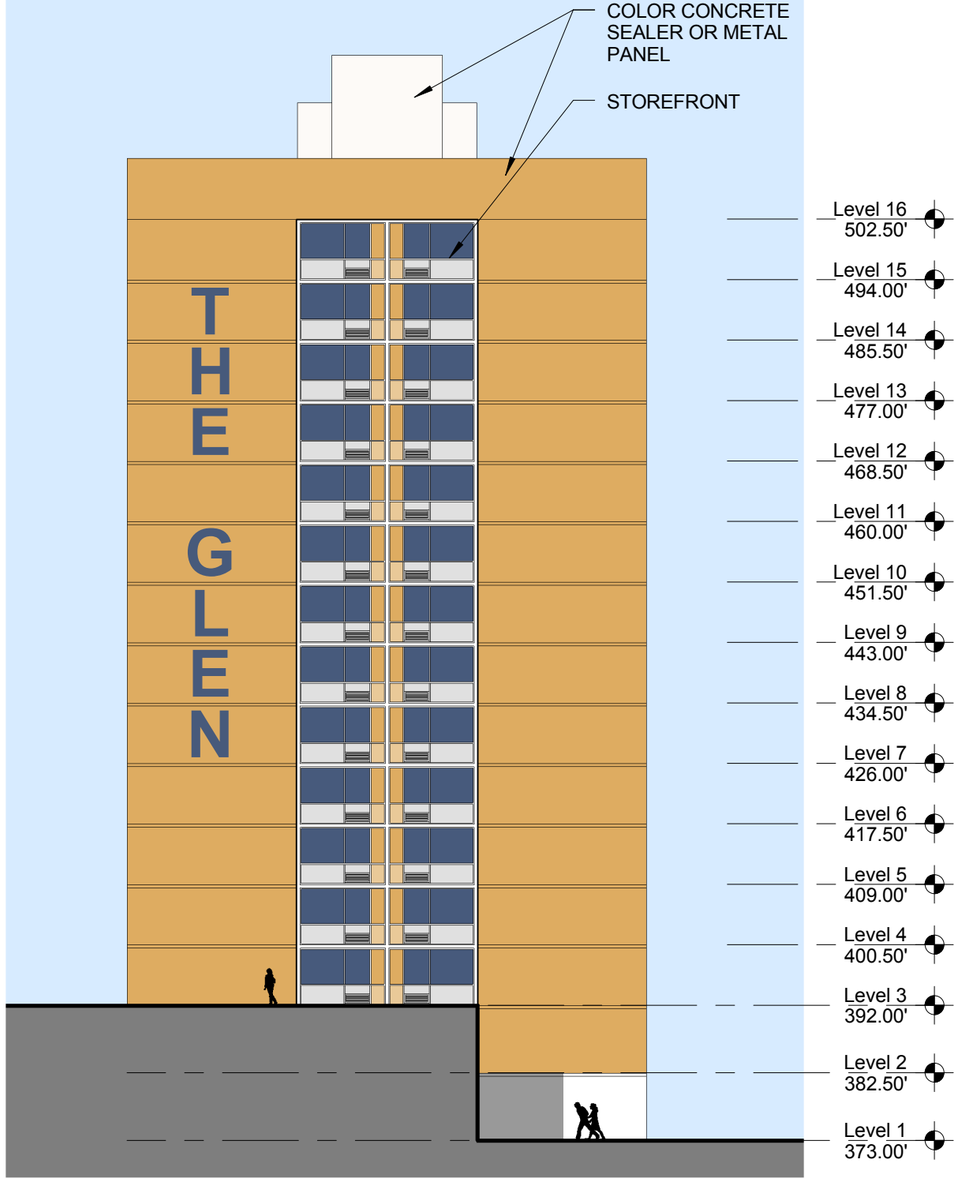


Figure 13 – Scheme "A" typical room layout with PTAC unit (existing floor slab indicated in red)



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

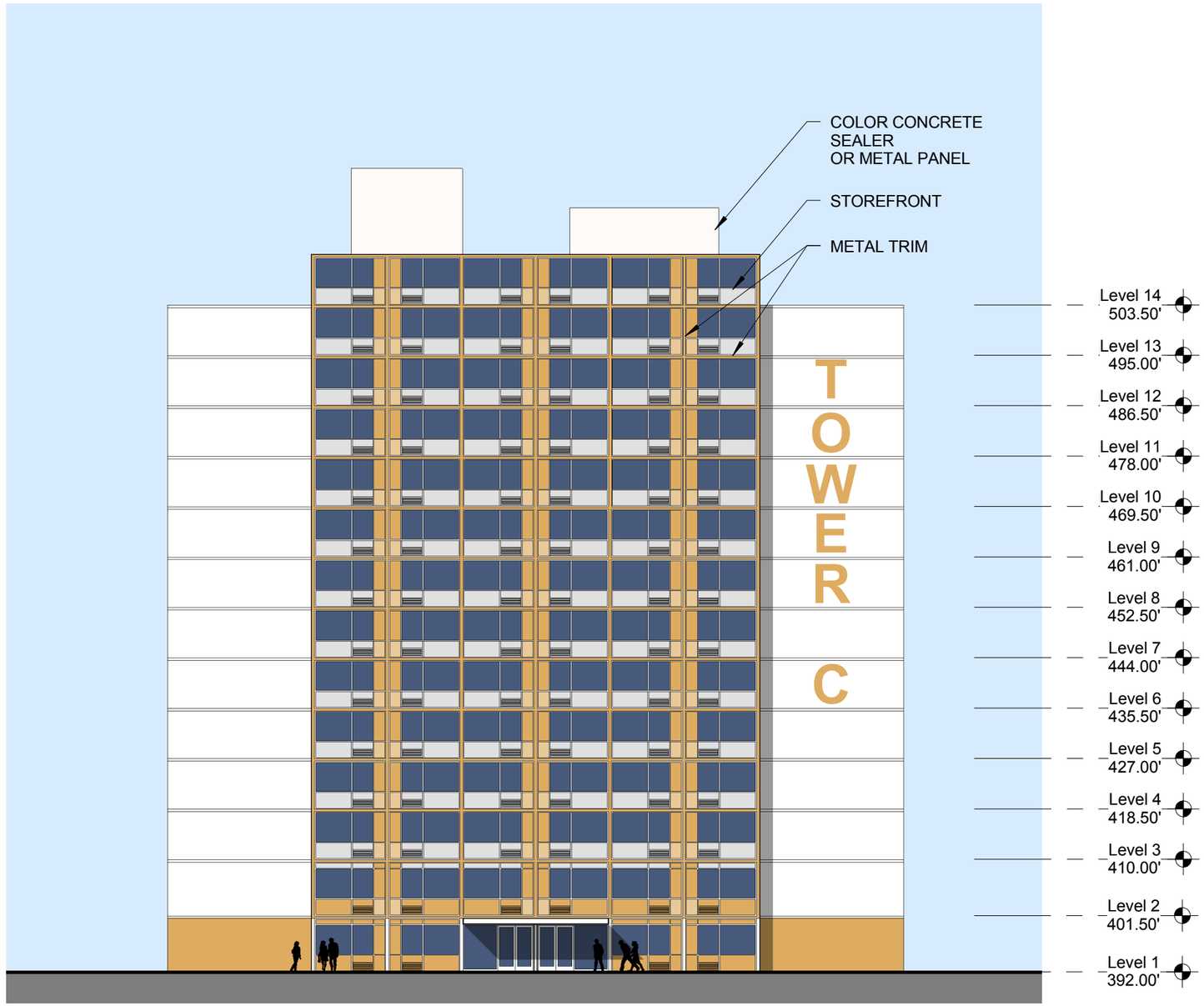
SCHEME A - STOREFRONT

TOWER A

DATE: 07/01/14

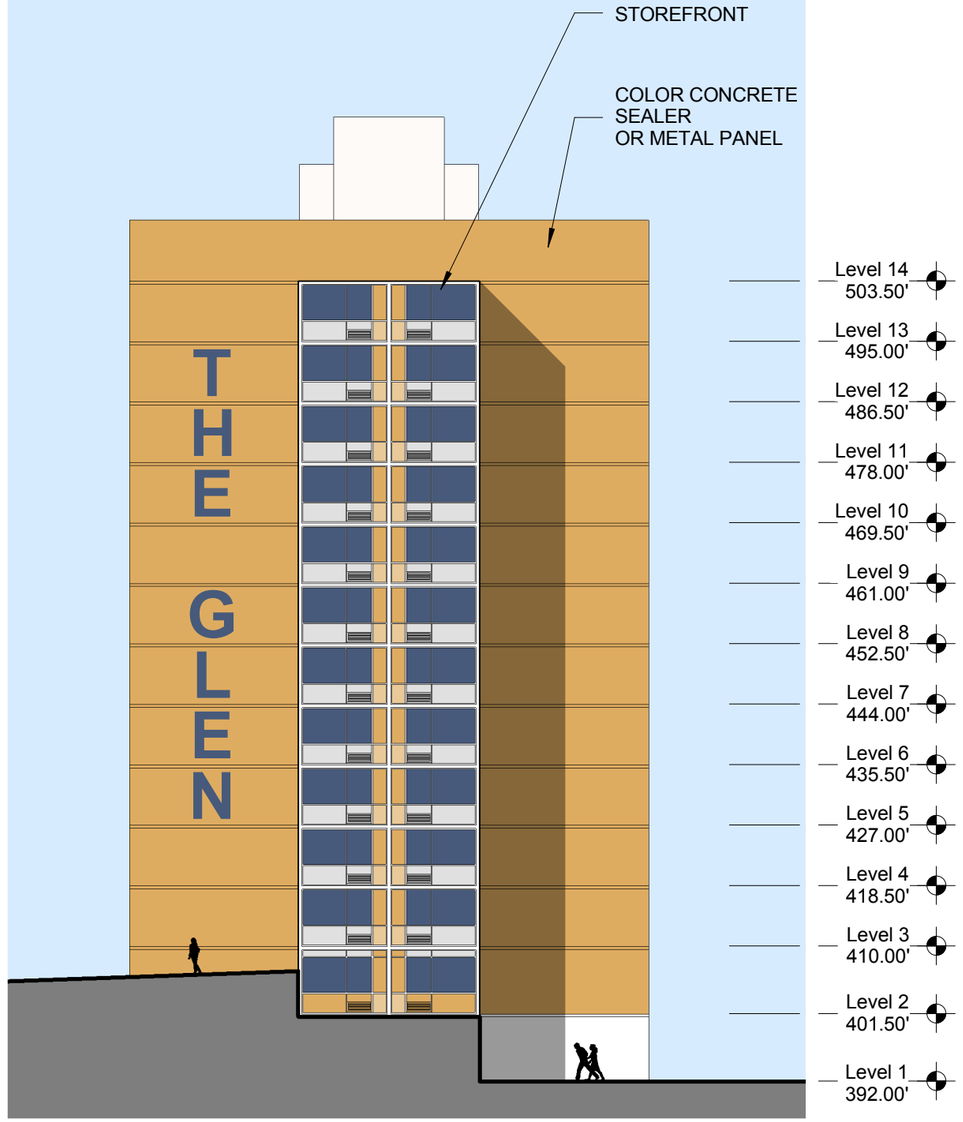
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

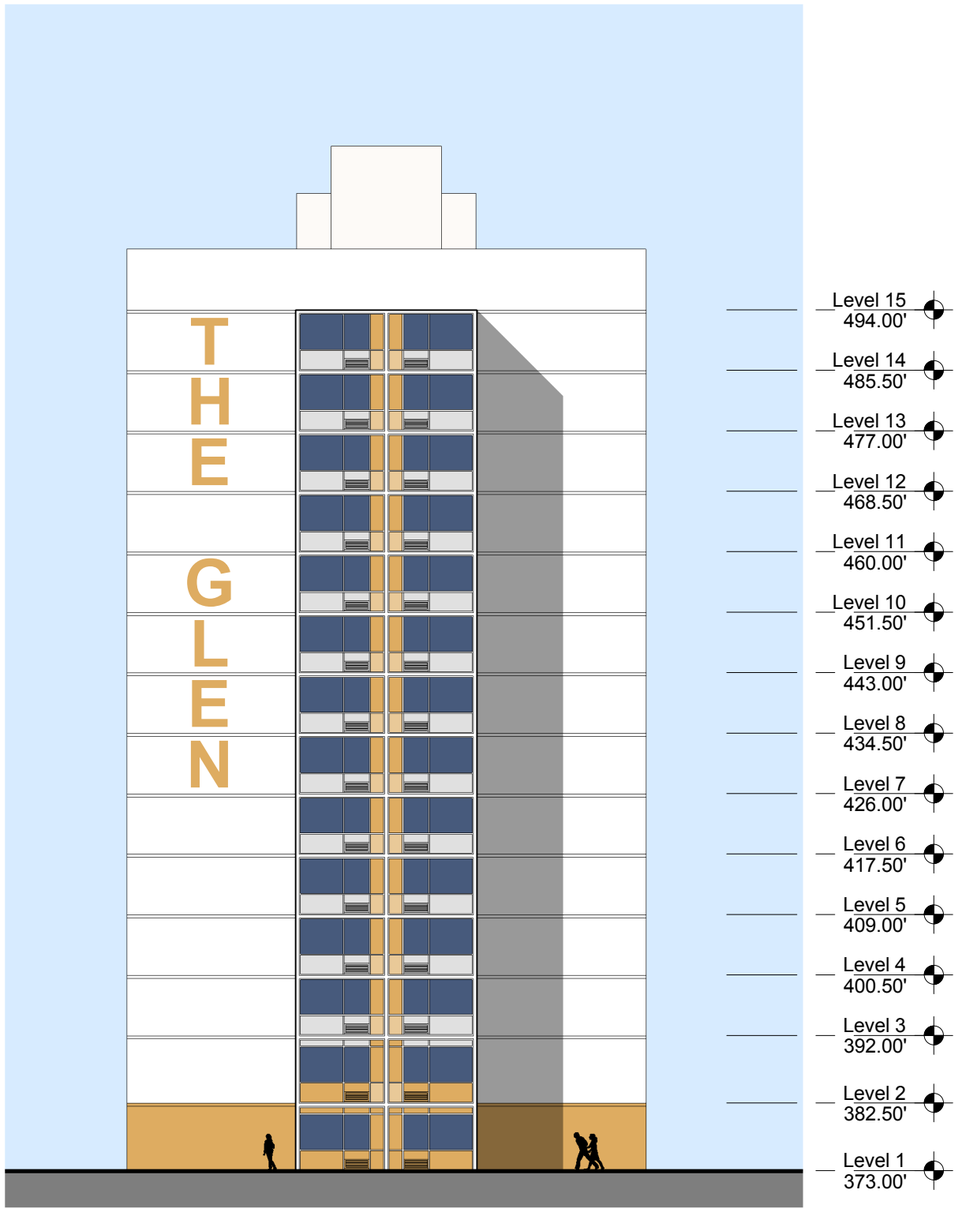
SCHEME A - STOREFRONT

TOWER C

DATE: 07/01/14

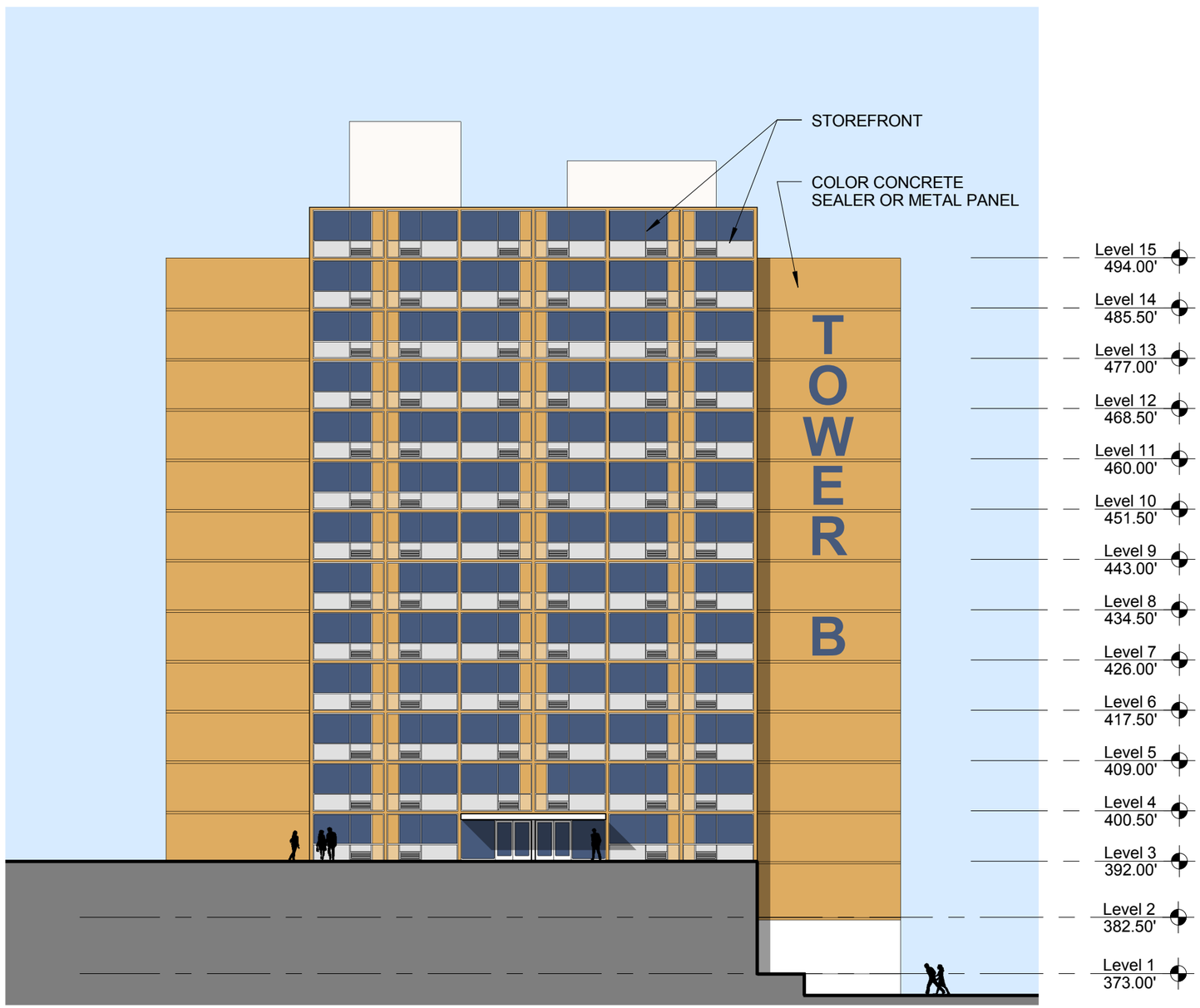
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

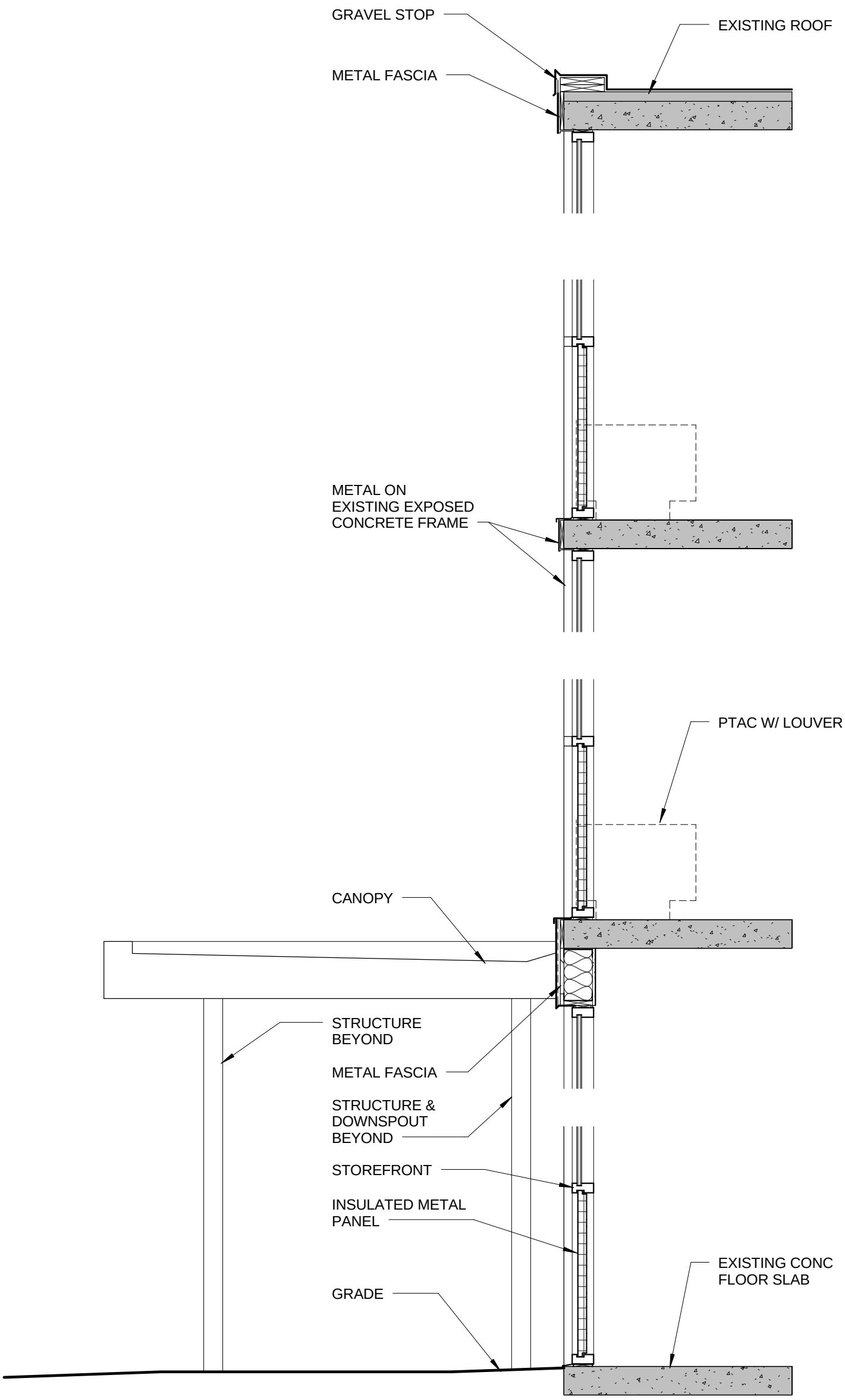
SCHEME A - STOREFRONT

TOWERS B + D (SIM)

DATE: 07/01/14

PHASE: SD

G|W
W|O



WALL SECTION

1/2" = 1'-0"

2 0 2 4

SCALE OF FEET
1/2" = 1'-0"

GLEN TOWERS

SCHEME A - STOREFRONT

WALL SECTION DATE: 07/01/14 PHASE: SD

G W
W O

Design Option B: Aluminum Curtain Wall System

This option attaches an aluminum curtain wall system to the outside face of existing concrete walls and slabs. The proportion of clear glass to spandrel remains the same. Opaque portions of the curtain wall would be glazed with insulated metal panels.

This system would be applied from the second floor to roof, while the ground floor could utilize an infill storefront similar to the existing and could sit on the existing edge of slab. The curtain wall would provide a slight overhang for the ground floor as illustrated in the following wall section. The exposed concrete frame at the ground floor jambs would be wrapped in metal. Unlike Option A, this option encapsulates the exposed concrete with the glazing system.

At the roof level, new stainless steel copings and flashing would extend out to cover the top of the curtain wall system.

The new PTAC unit will need to sit further outboard from the edge of the existing concrete slab (shown in red in Figure 14). This may require modification to the in-slab electrical conduit.

This scheme offers more flexibility in its vertical/horizontal proportioning than Option A's storefront, and would appear more uniform and flatter (see Figure 15). This option will require continuous fire separation at the edge of each floor slab and would be the most expensive solution.

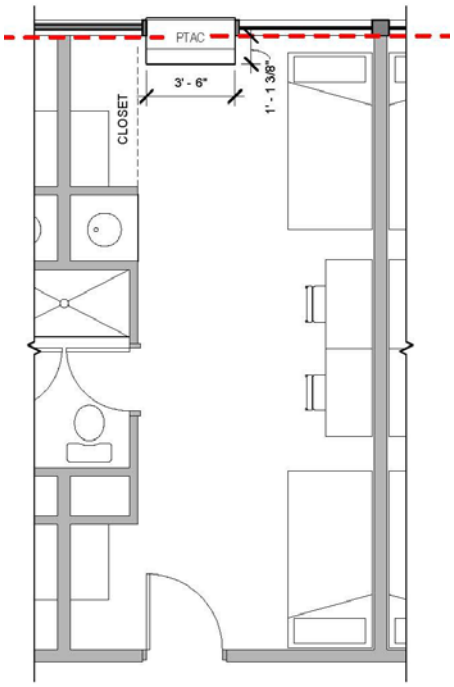


Figure 14 – Scheme "B" typical room layout with PTAC unit (existing floor slab indicated in red)

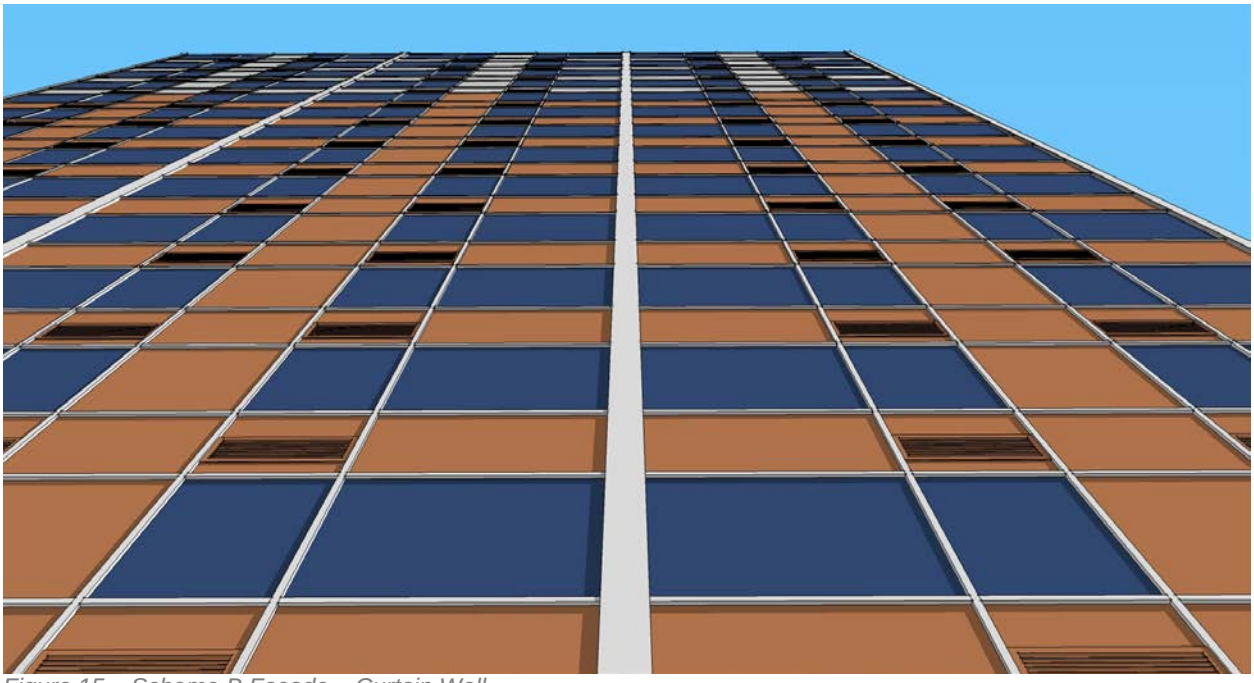


Figure 15 – Scheme B Façade – Curtain Wall

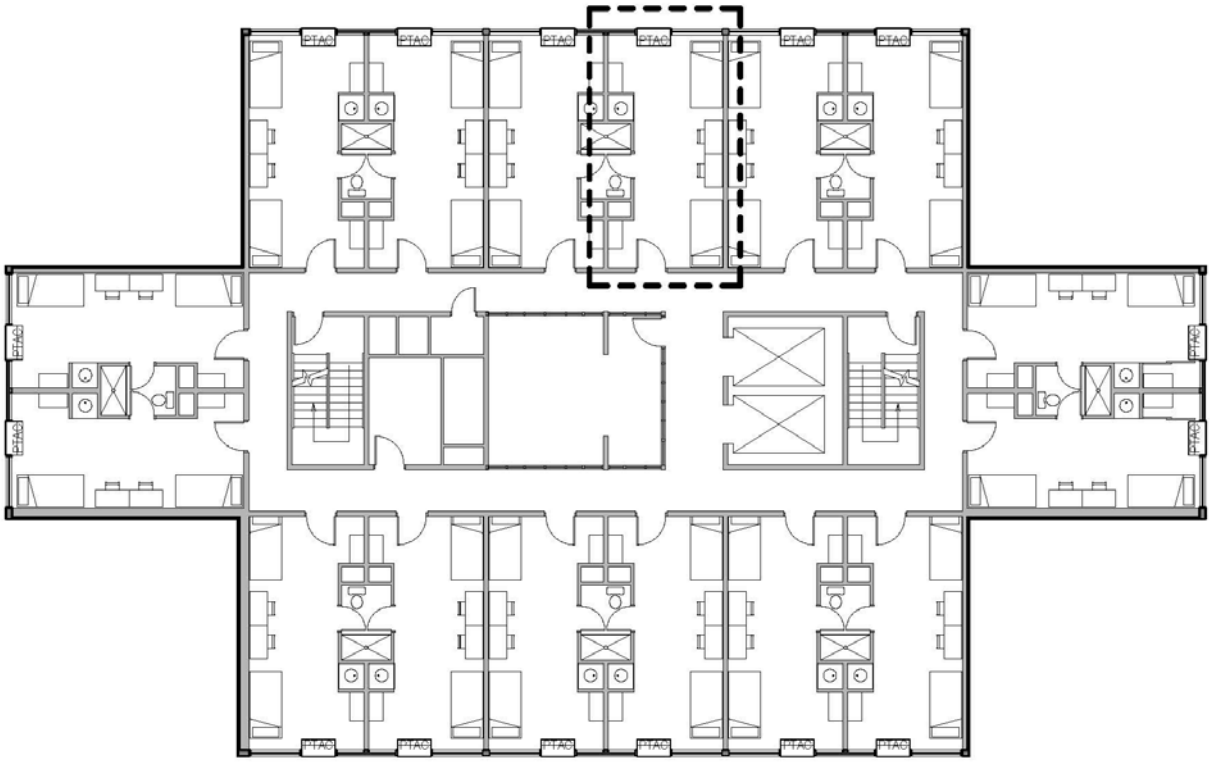
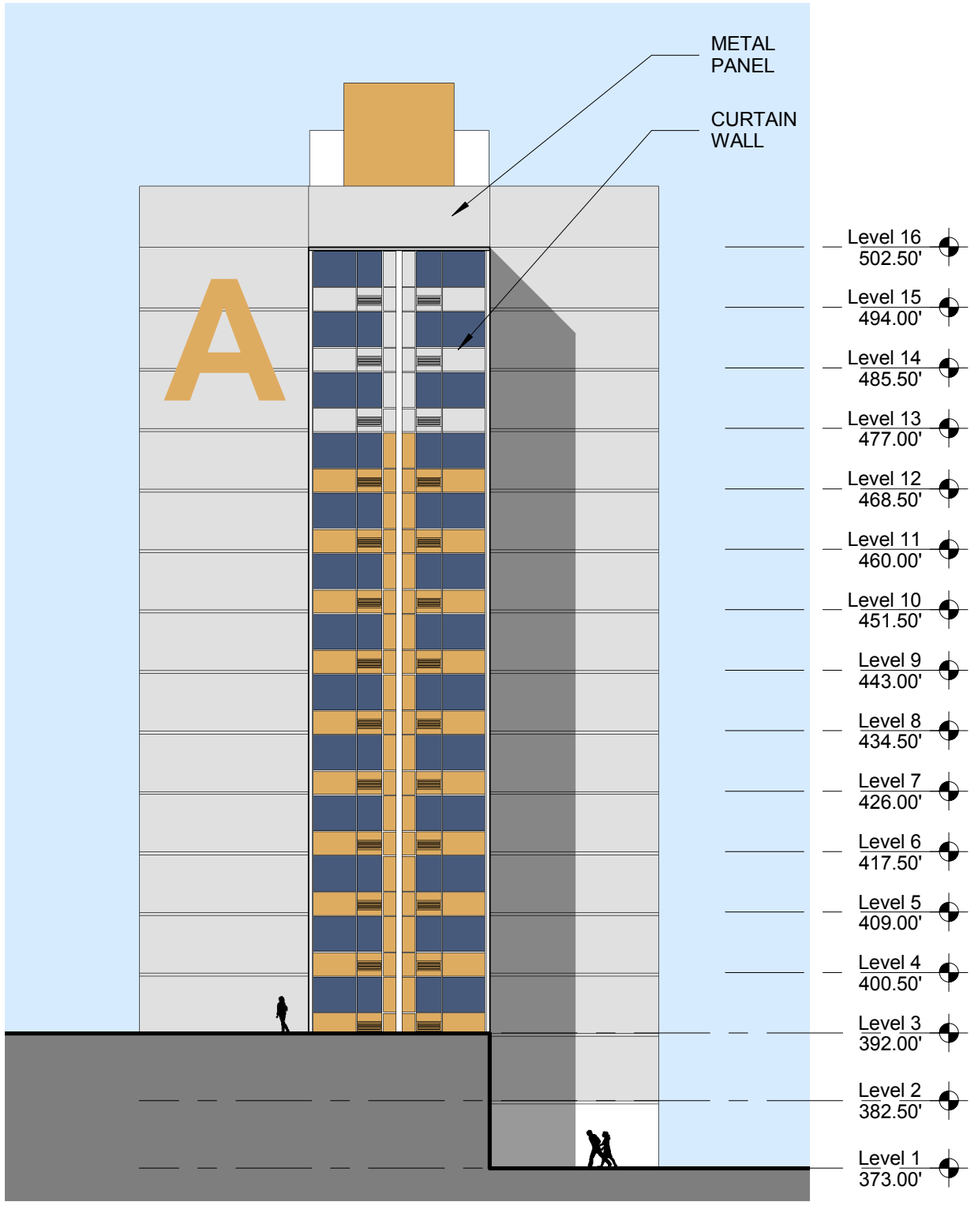


Figure 16 – Typical Floor Plan

NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

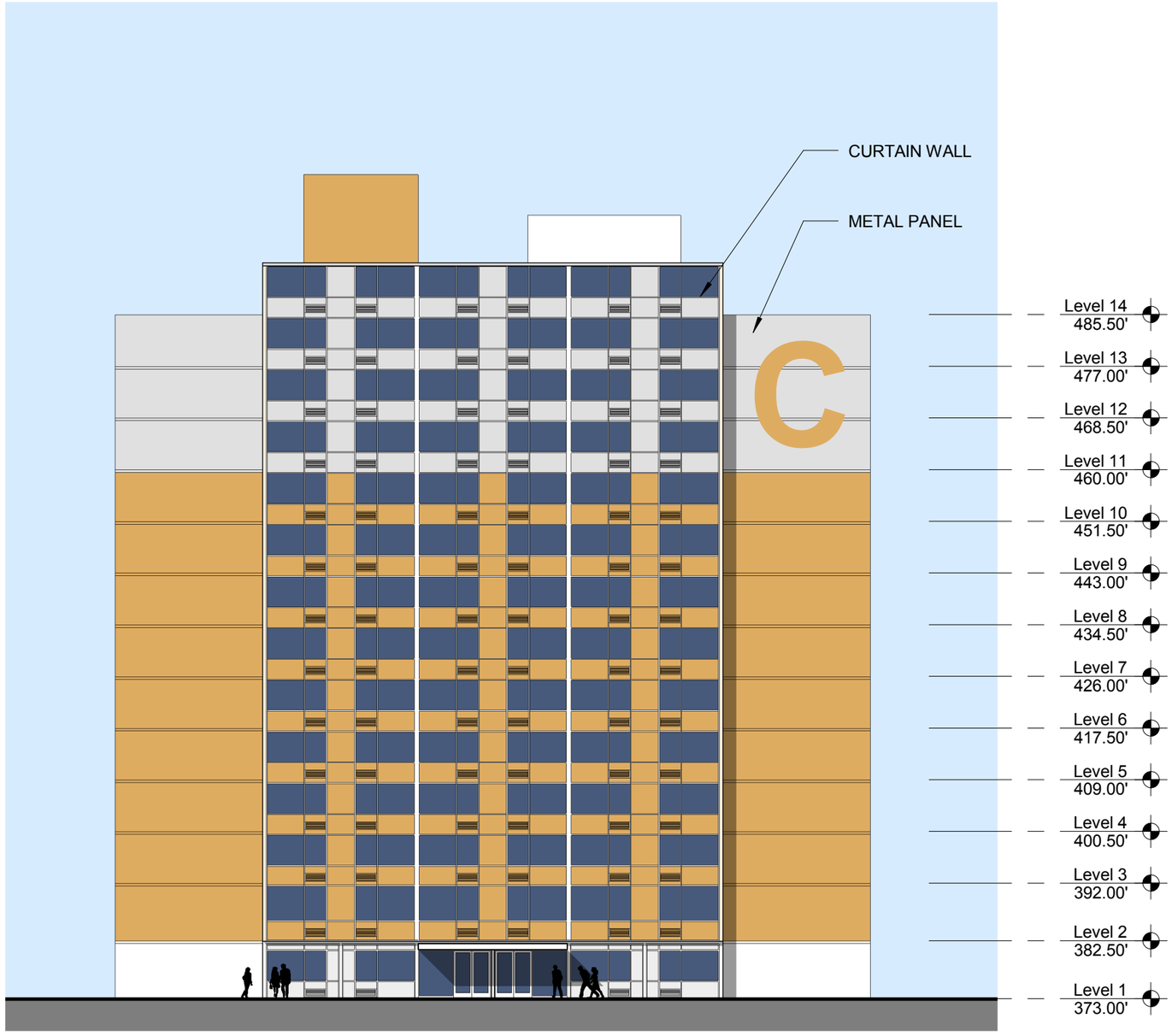
SCHEME B - CURTAINWALL

TOWER A

DATE: 07/01/14

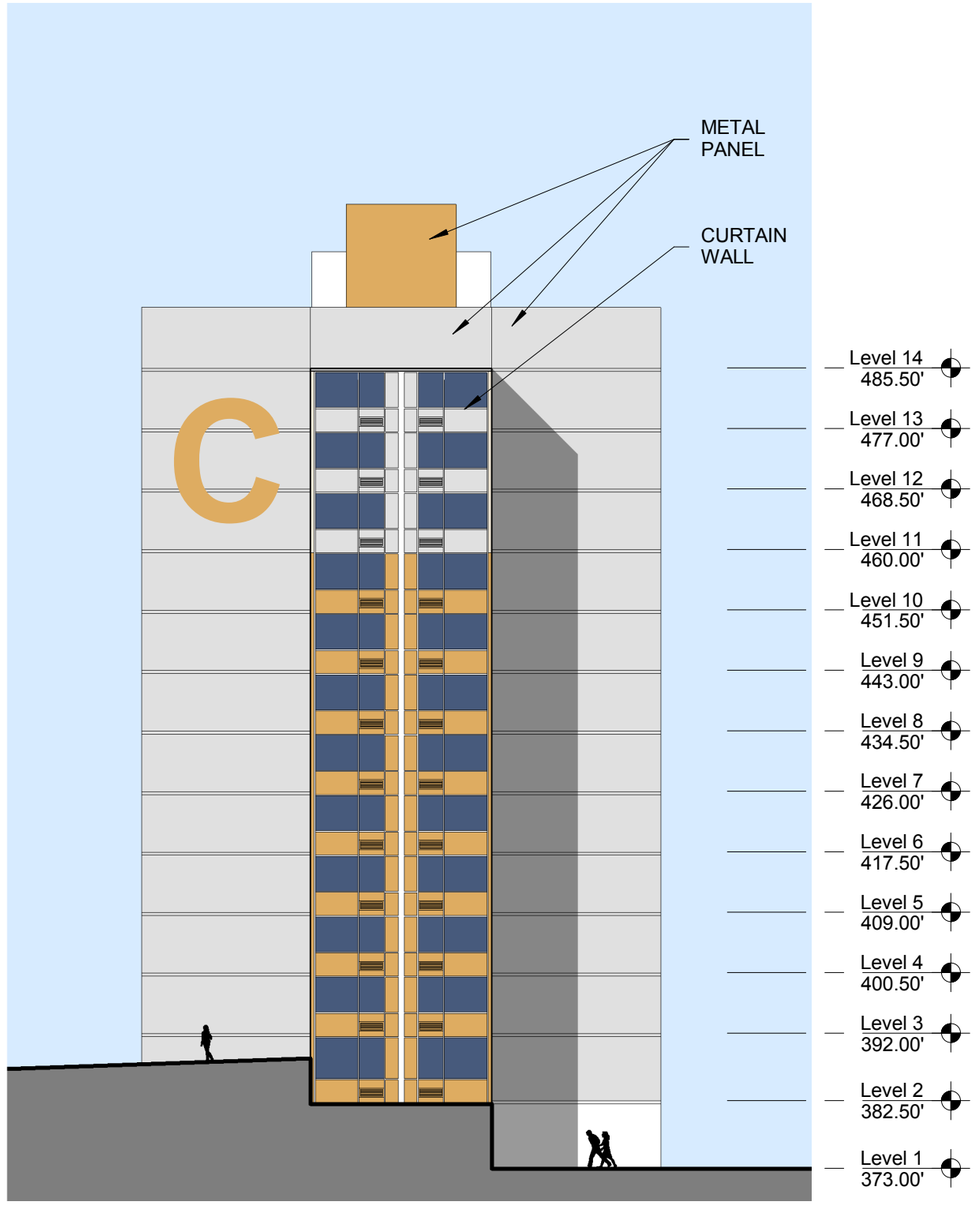
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

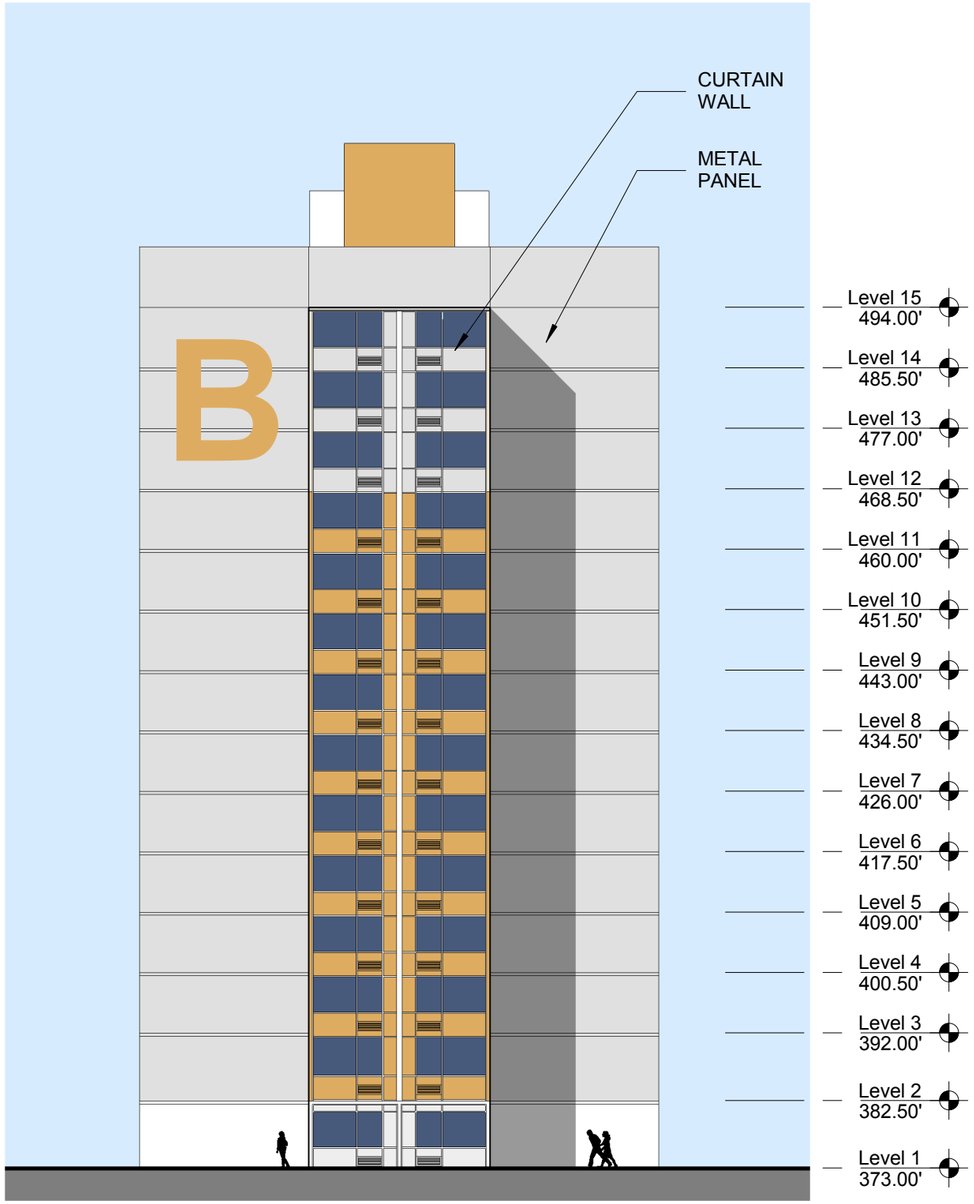
SCHEME B - CURTAINWALL

TOWER C

DATE: 07/01/14

PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"

EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

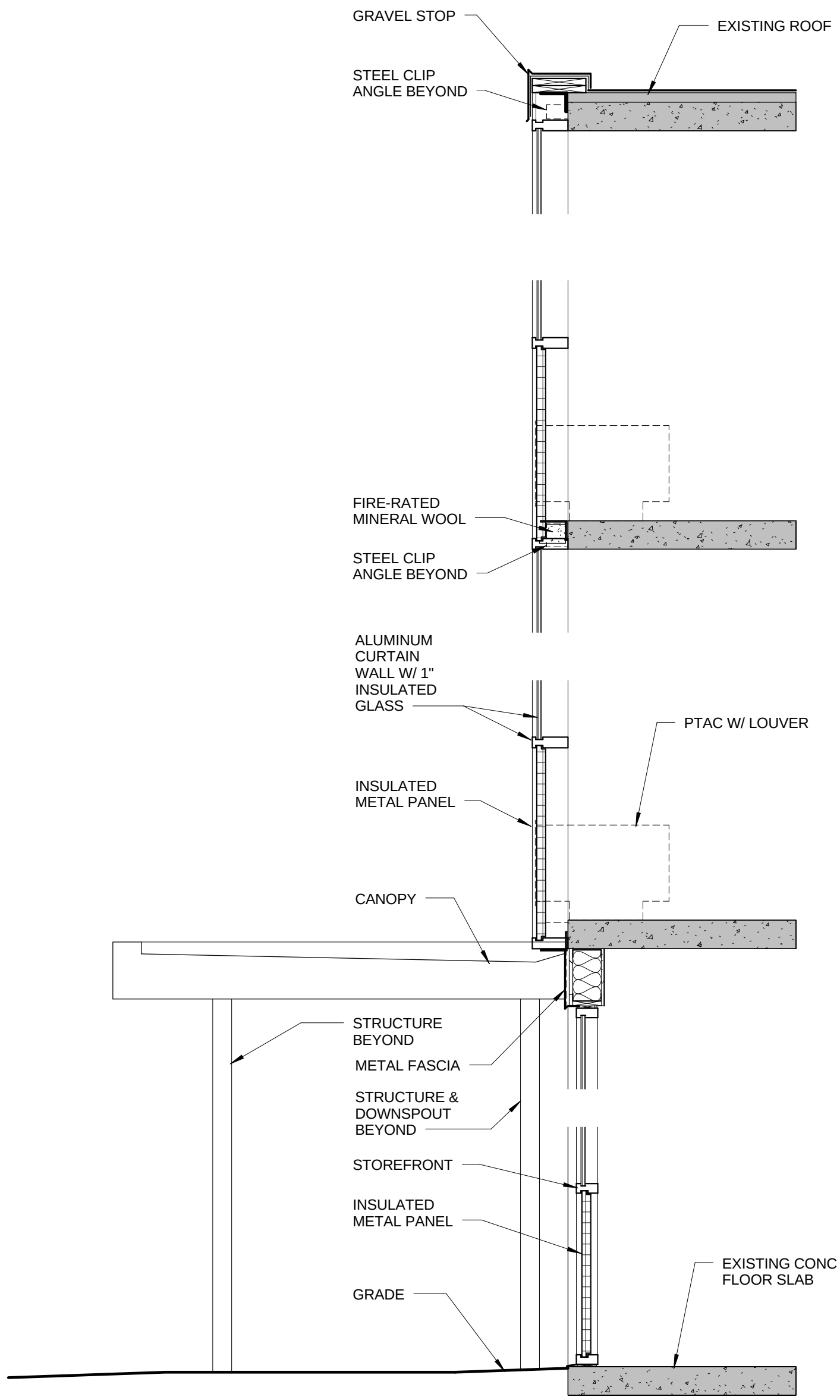
SCHEME B - CURTAINWALL

TOWERS B + D (SIM)

DATE: 07/01/14

PHASE: SD

G|W
W|O



WALL SECTION

1/2" = 1'-0"

2 0 2 4

SCALE OF FEET
1/2" = 1'-0"

GLEN TOWERS SCHEME B - CURTAINWALL

WALL SECTION DATE: 07/01/14 PHASE: SD

G W
W O

Design Option C1 (Terracotta) and C2 (Metal Panel): Metal-framed Rainscreen with Windows

This option attaches metal stud framing to the face of existing concrete slabs and walls. The framing members would span horizontally, and would be supported by the existing concrete walls. A rainscreen system utilizing terracotta (see Figure 18) or metal panels (see Figure 19) would be utilized at opaque areas of the façades, with aluminum windows. The wall would also have batt insulation and gypsum board to improve the envelope's thermal performance.

As shown in Figure 17, the new PTAC unit location would be further out from the edge of the existing concrete slab (indicated in red), which may require modification to the in-slab electrical conduit.

This system could be applied from the second floor to roof, tucking the ground floor within the current envelope and slab. This option would also require continuous fire separation at each floor slab.

Similar to Design Option B at the roof level, new stainless steel copings with flashing would extend out to cover the top of the rainscreen wall system. The wall can extend up beyond the existing roof to create a parapet (as shown in the Wall Section).

This scheme offers the most flexibility in its vertical/horizontal proportioning, as well as articulation of surfaces. Sizes of window openings could also be increased or decreased.

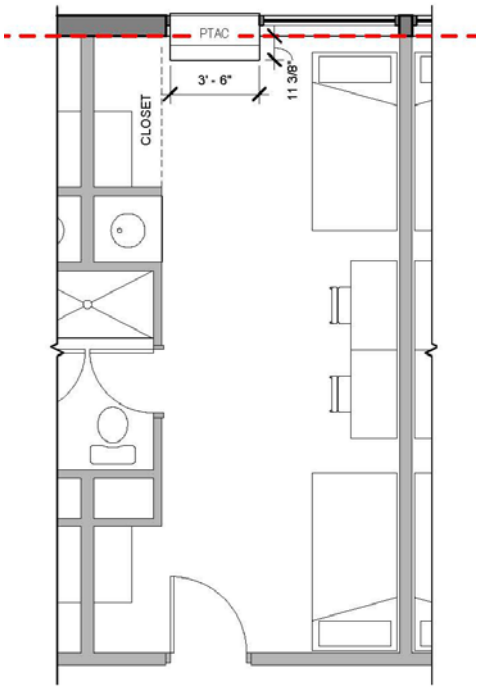


Figure 17 – Schemes C1 and C2 typical room layout with PTAC unit
(existing floor slab indicated in red)

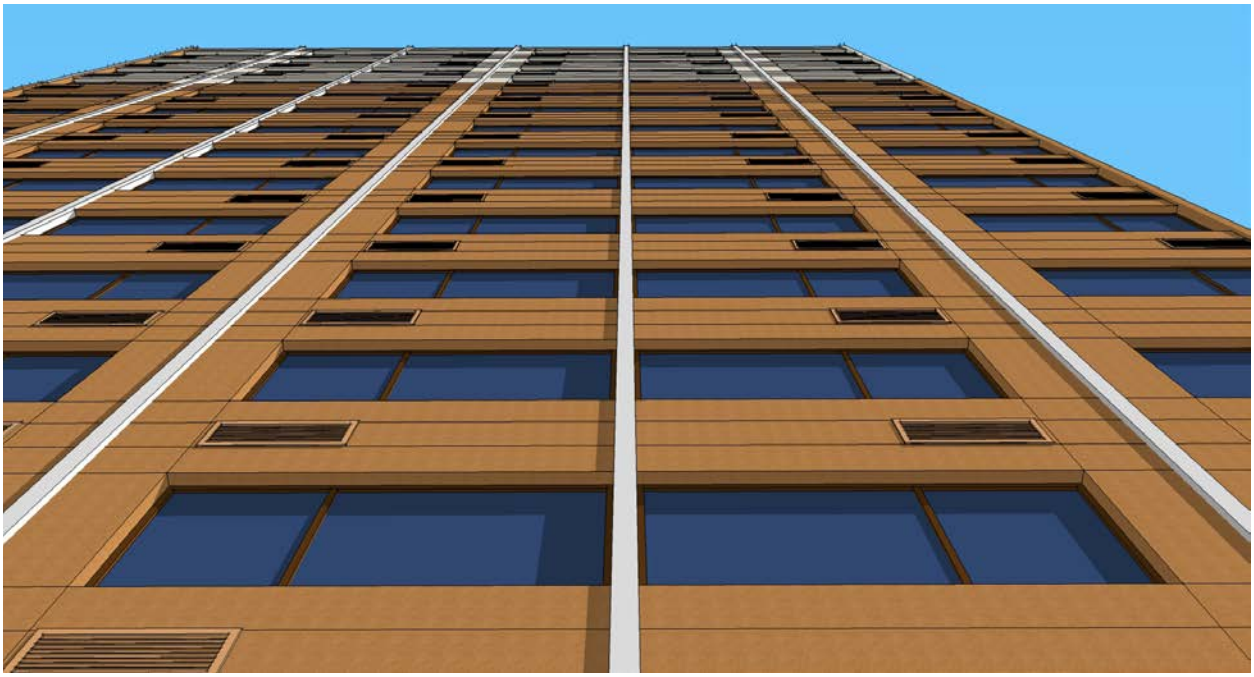


Figure 18 – Scheme C1 Façade – Terracotta Panels

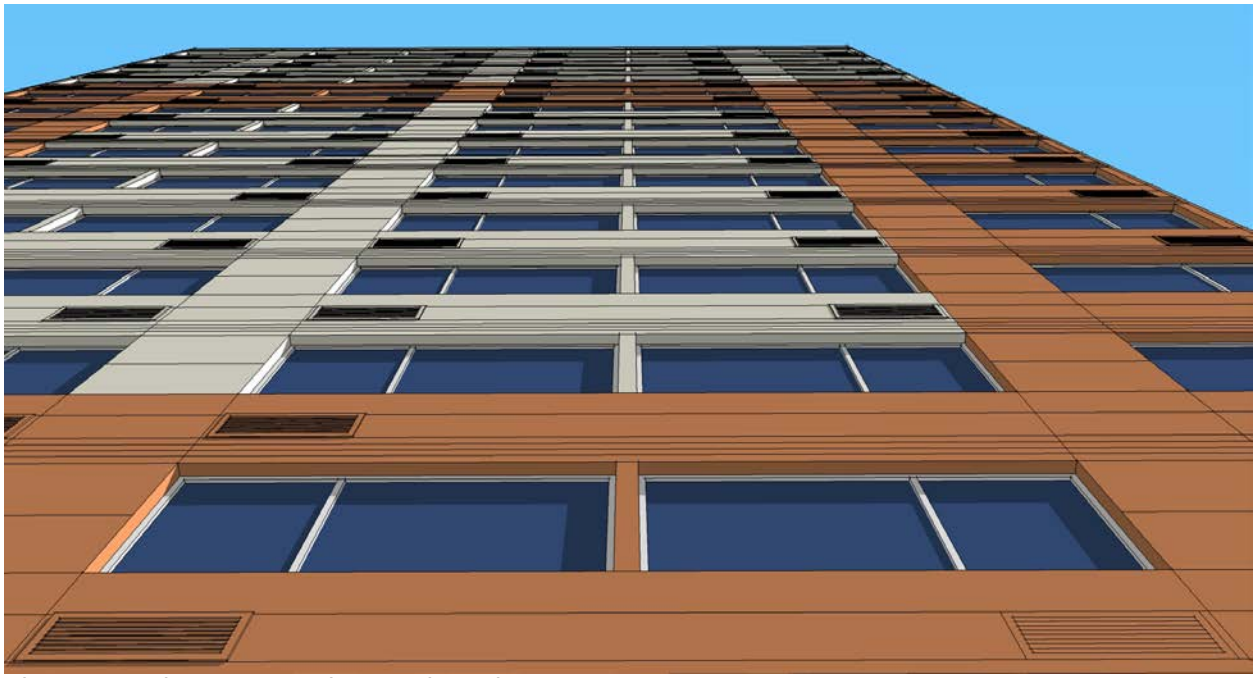


Figure 19 – Scheme C2 Façade – Metal Panels

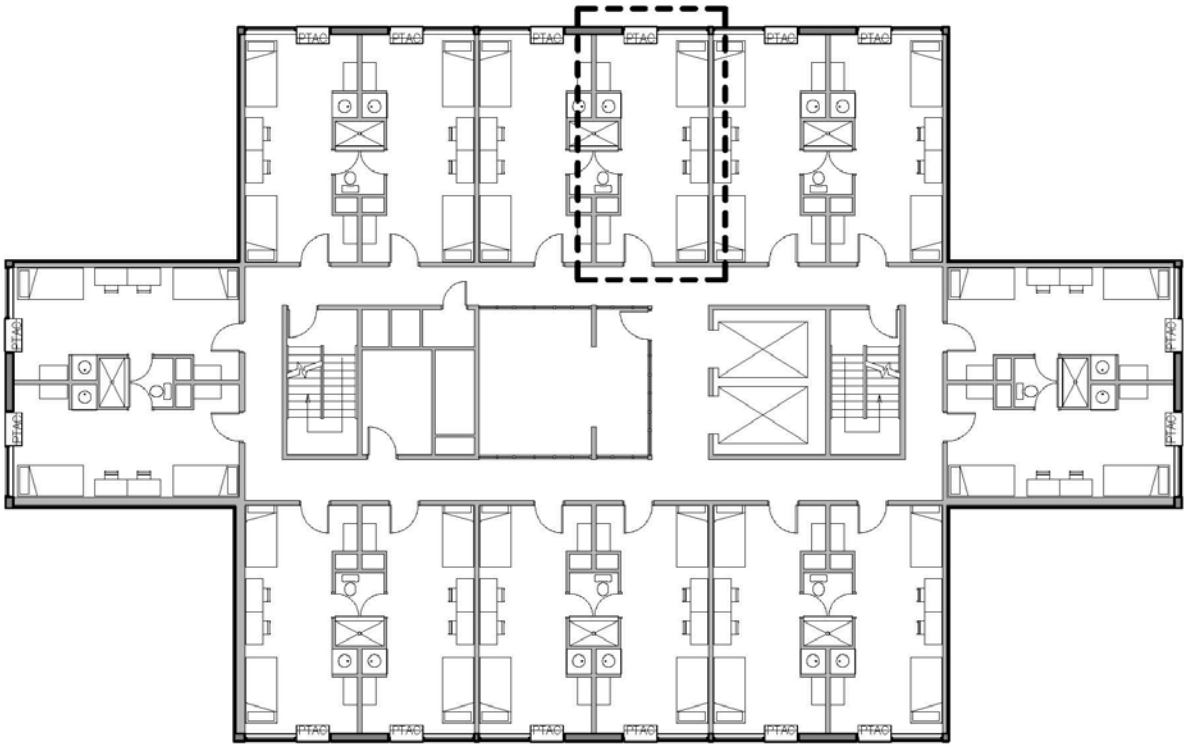
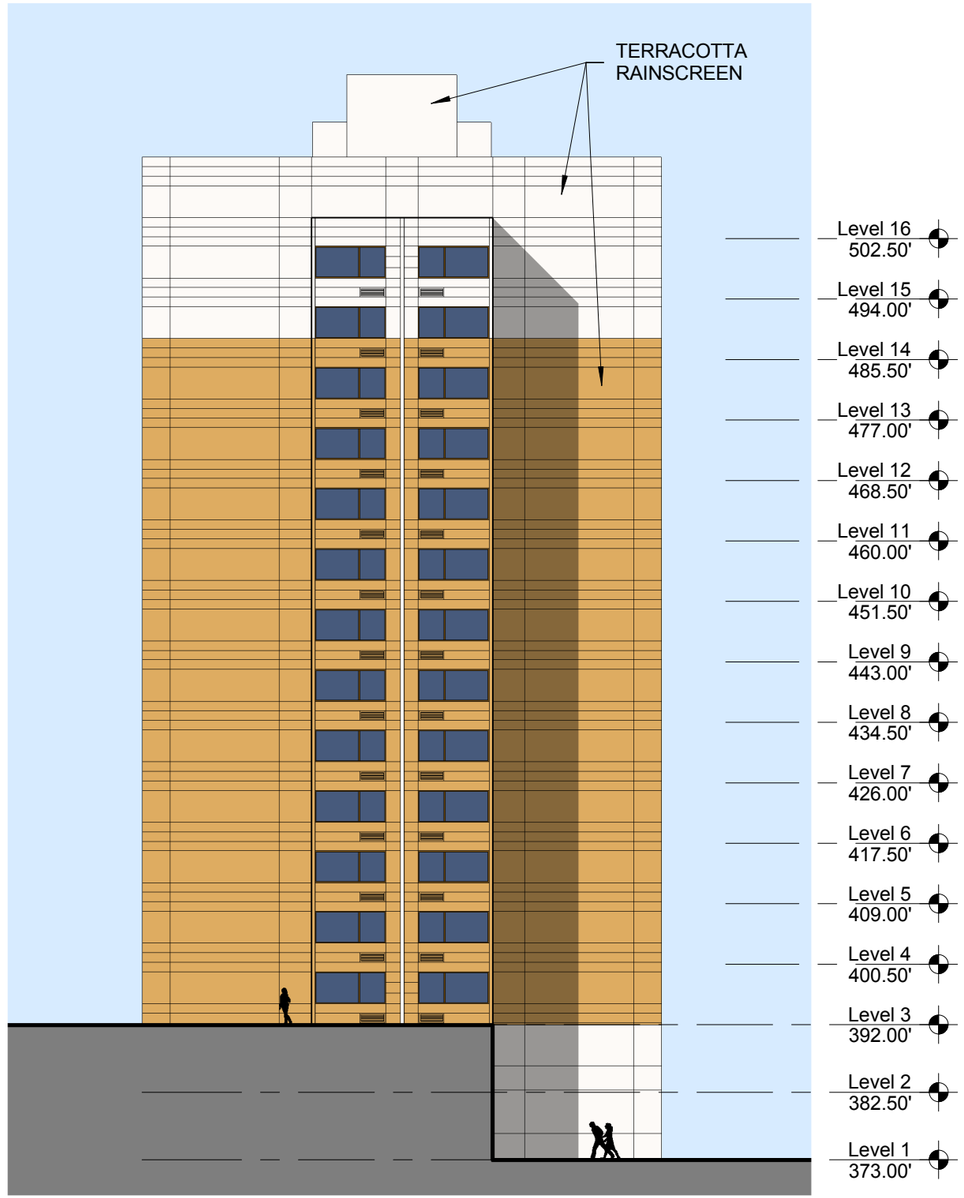


Figure 20 – Typical Floor Plan

NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

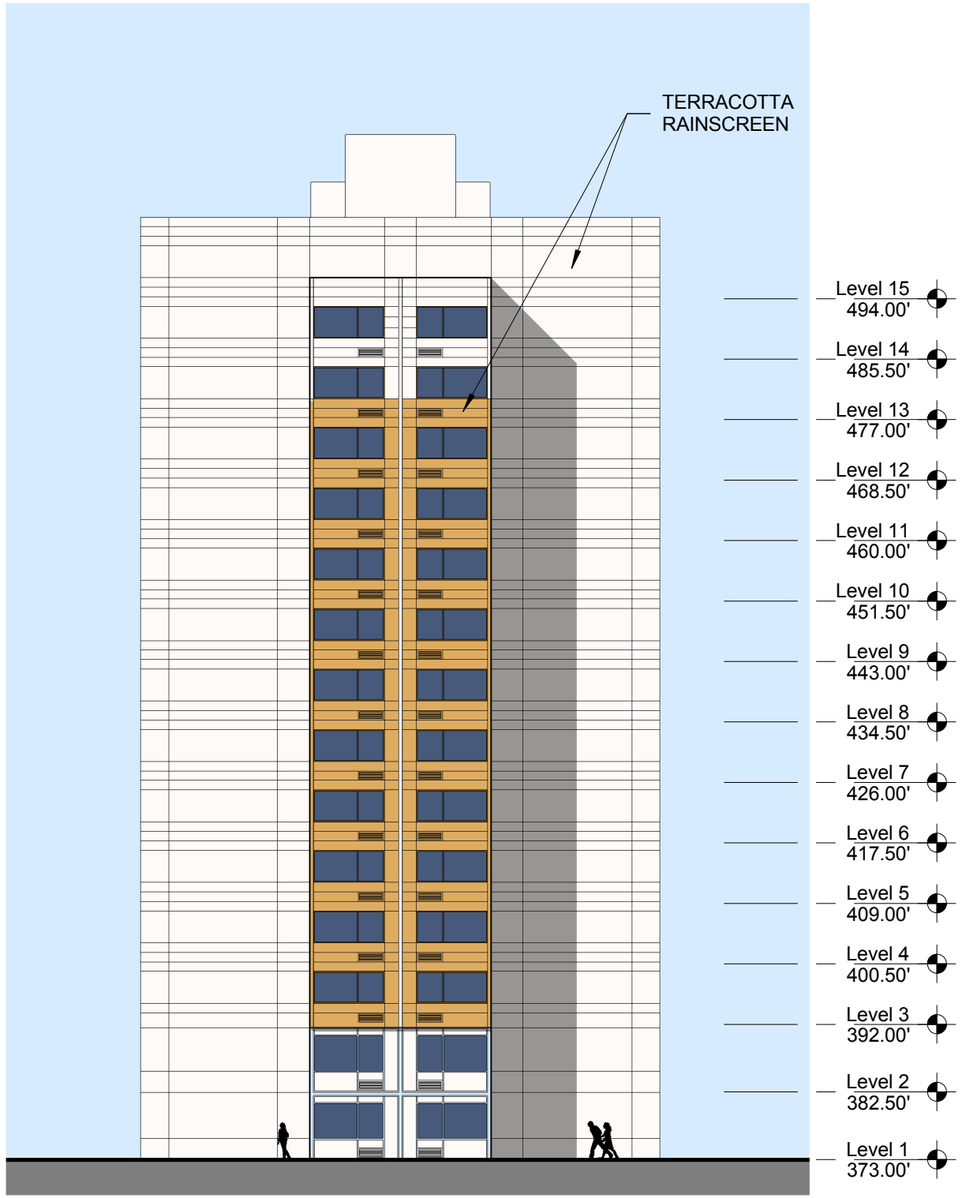
SCHEME C1 - TERRACOTTA RAIN SCREEN

TOWER A

DATE: 07/01/14

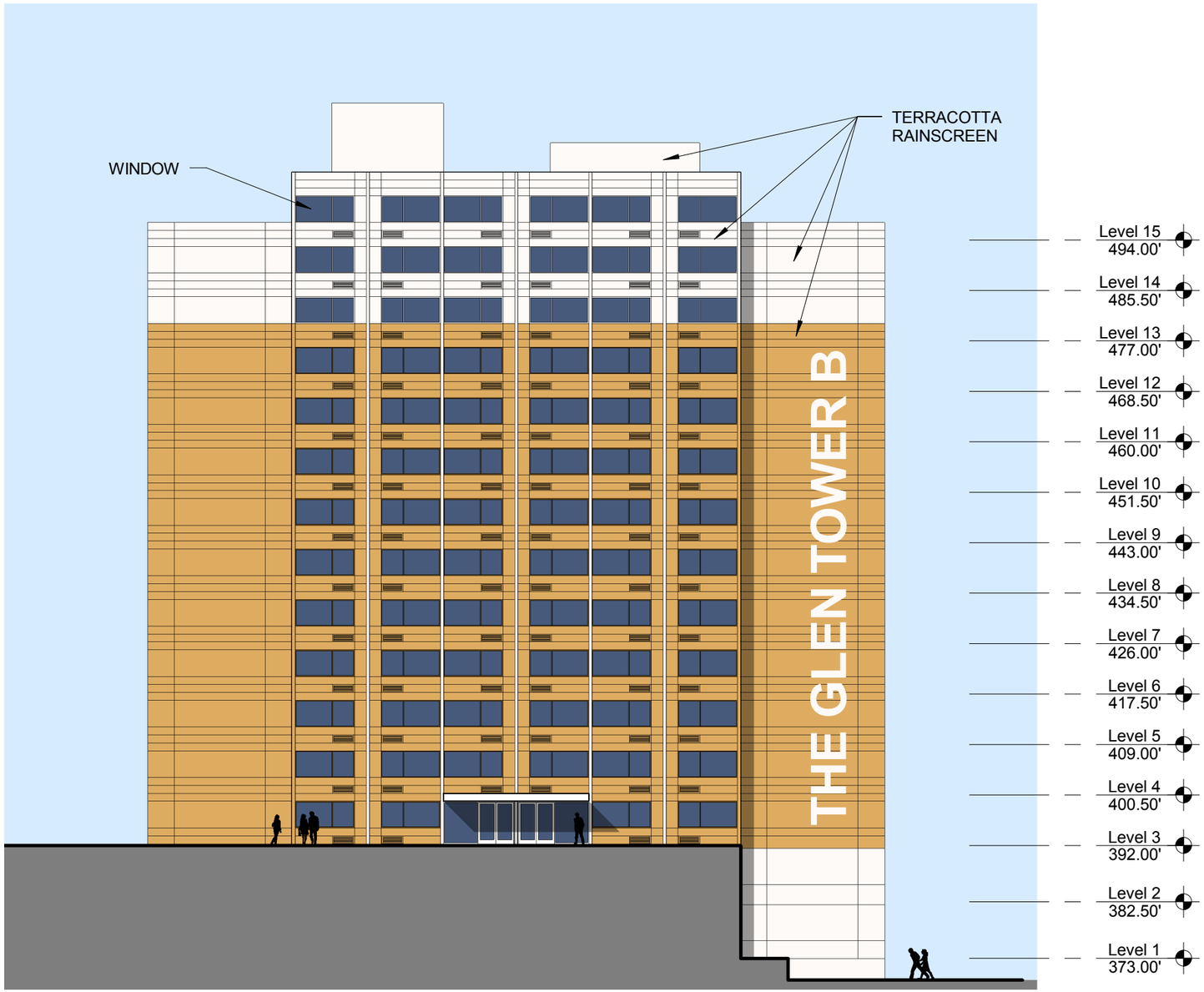
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

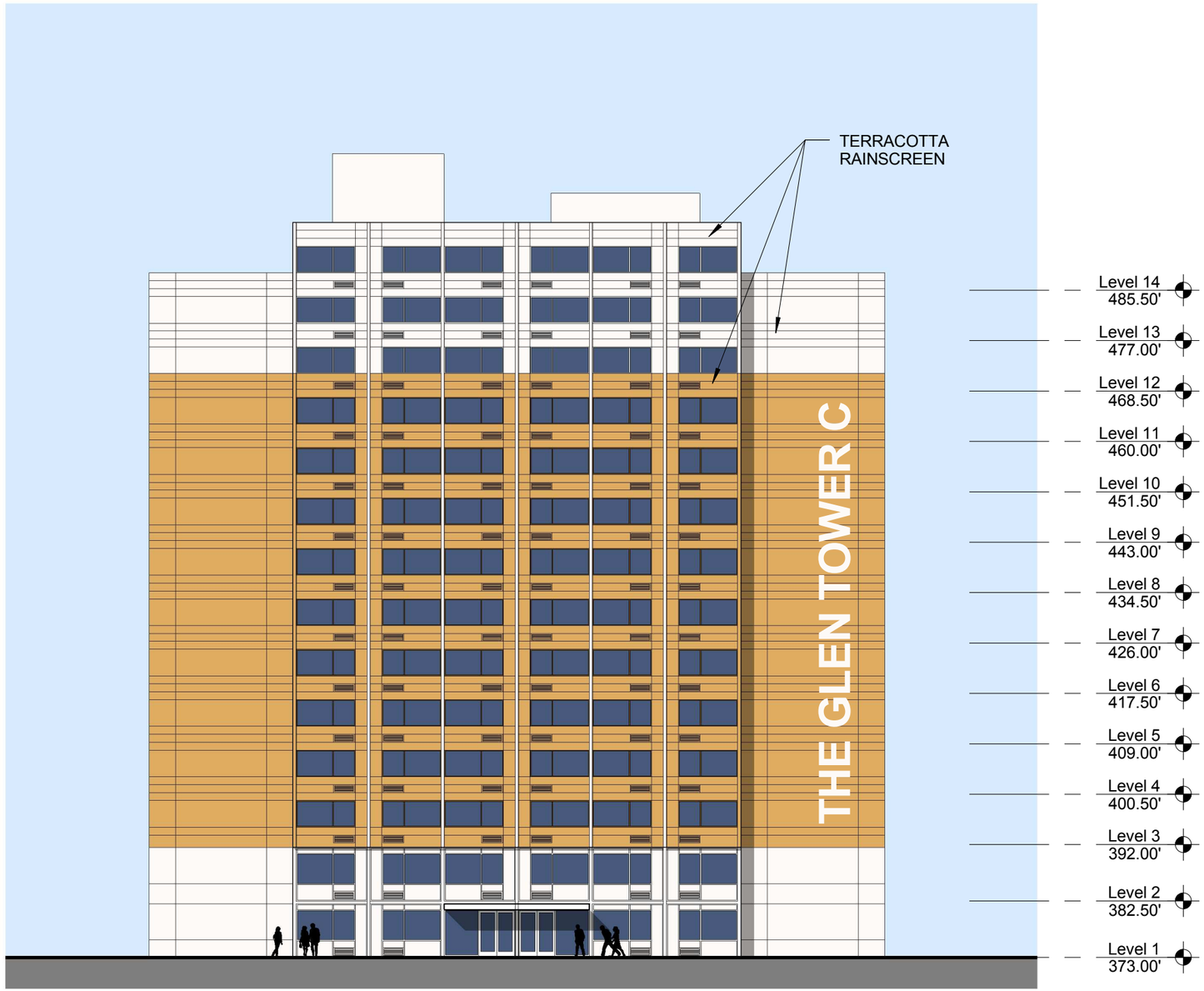
SCHEME C1 - TERRACOTTA RAIN SCREEN

TOWERS B + D (SIM)

DATE: 07/01/14

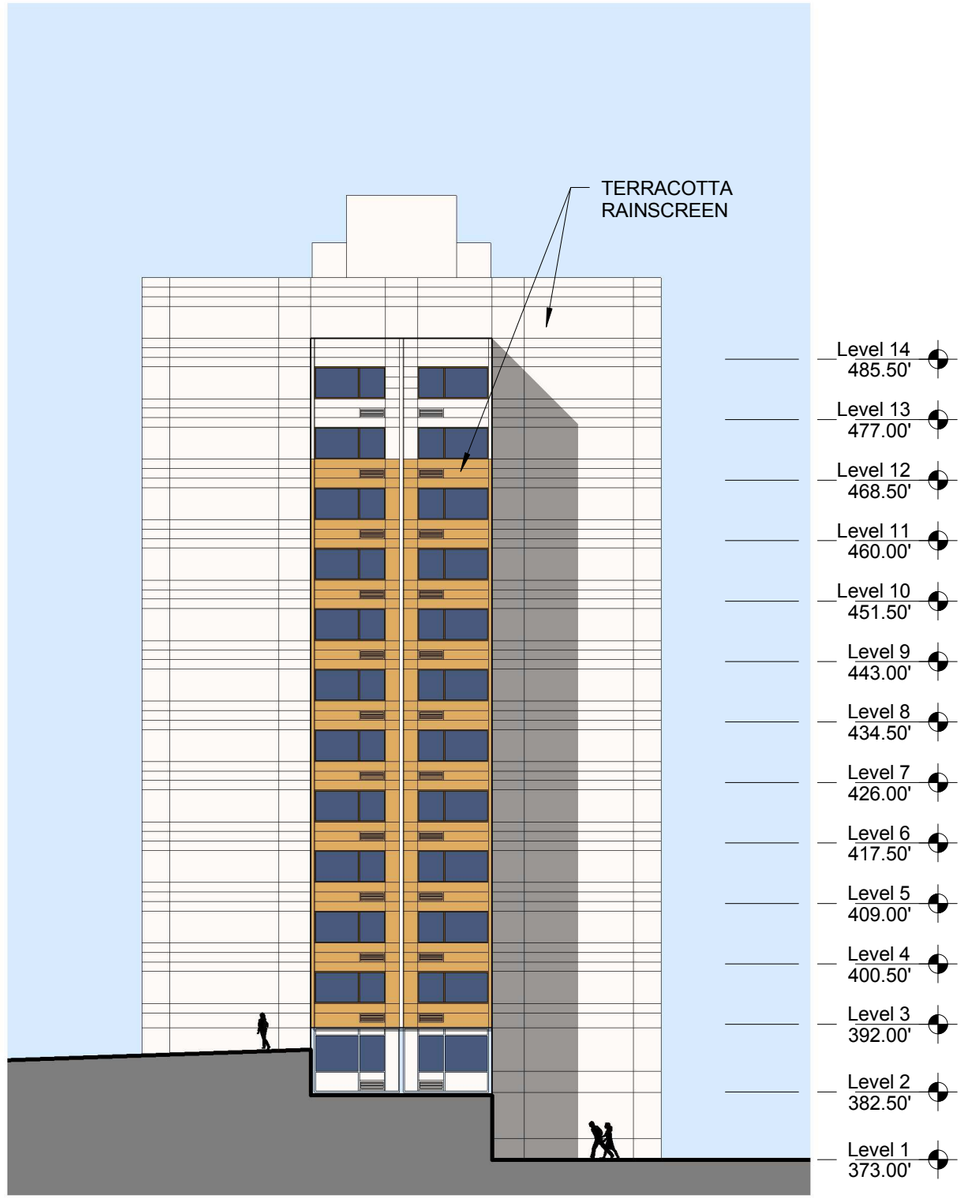
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

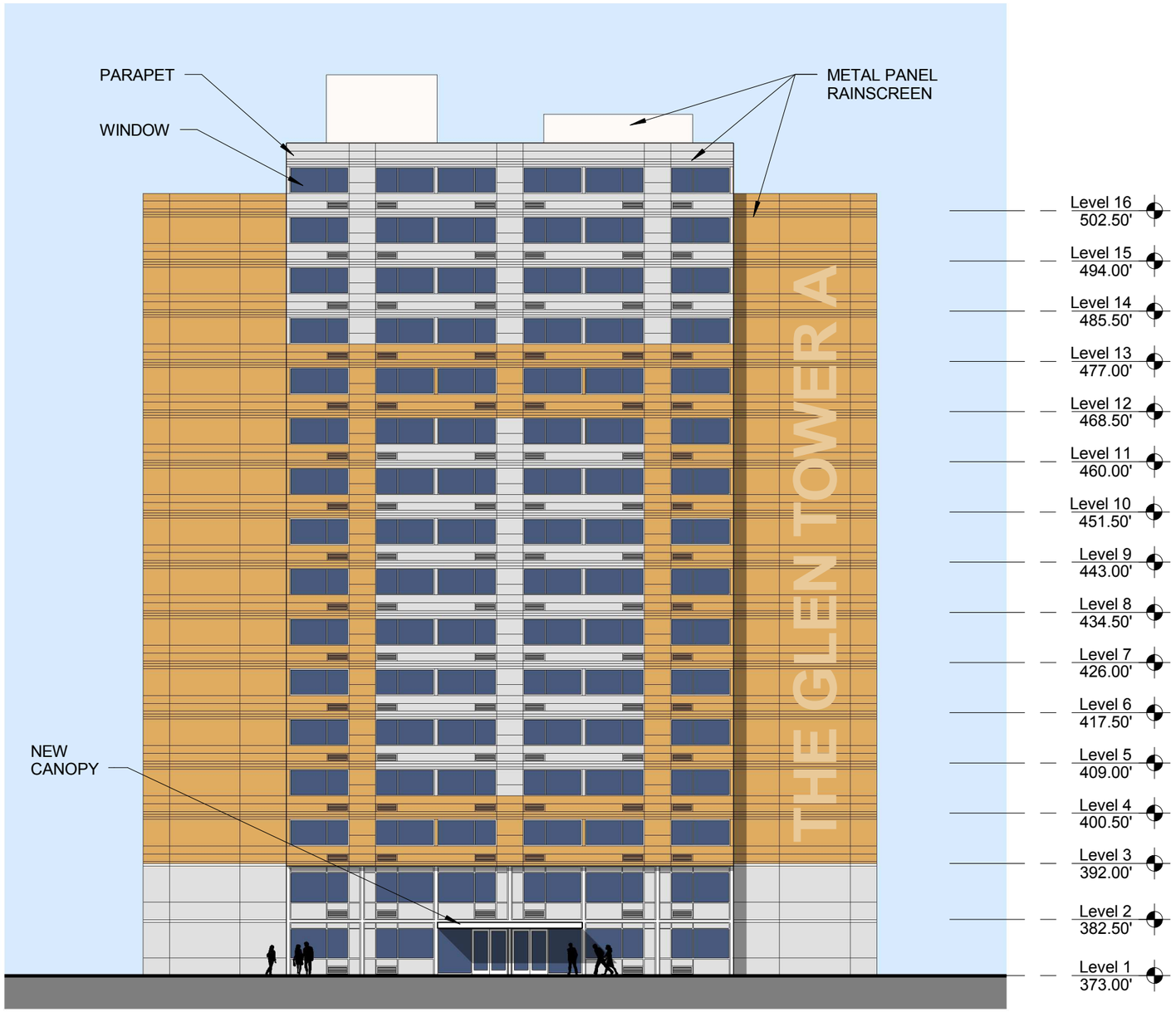
SCHEME C1 - TERRACOTTA RAIN SCREEN

TOWER C

DATE: 07/01/14

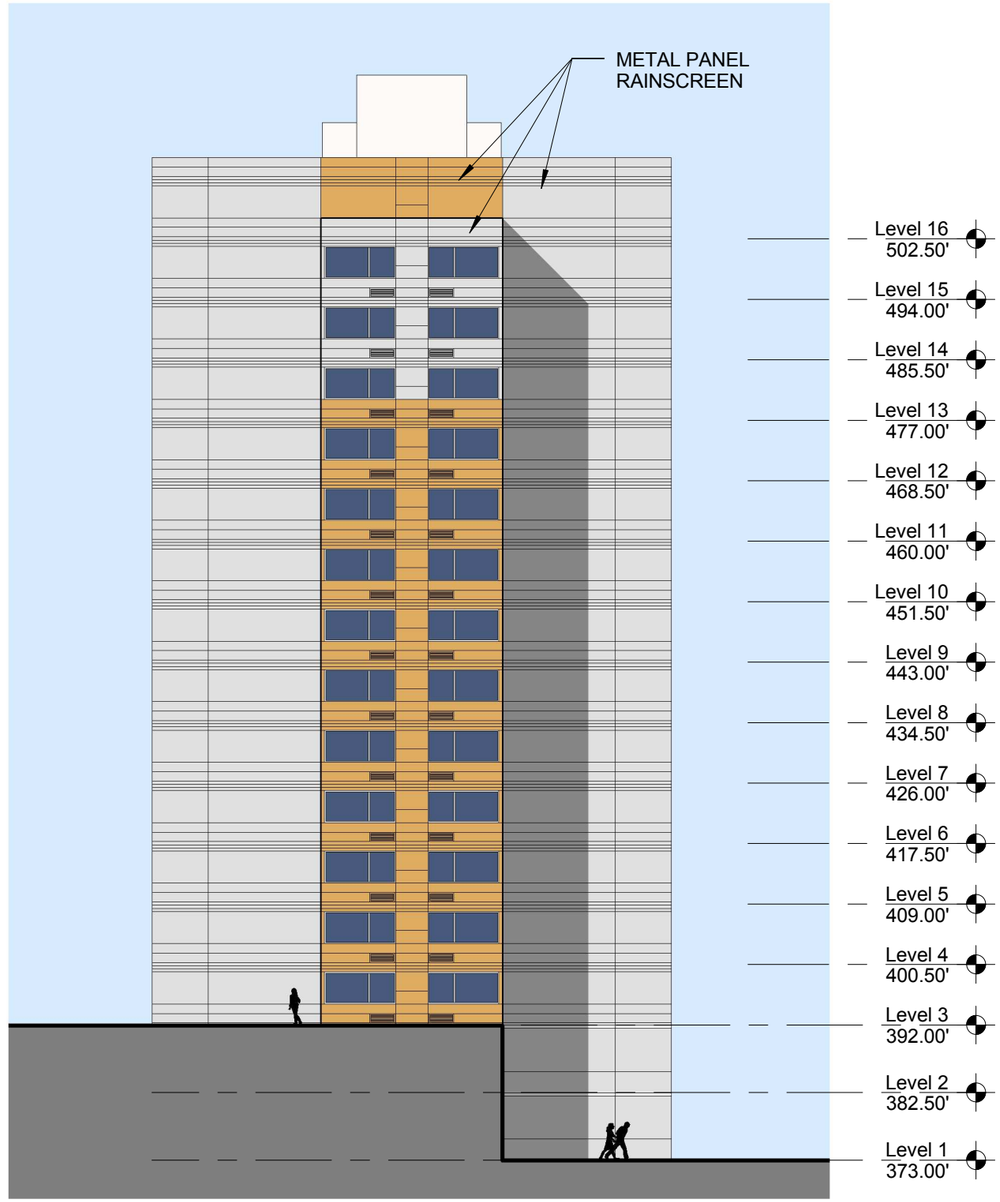
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

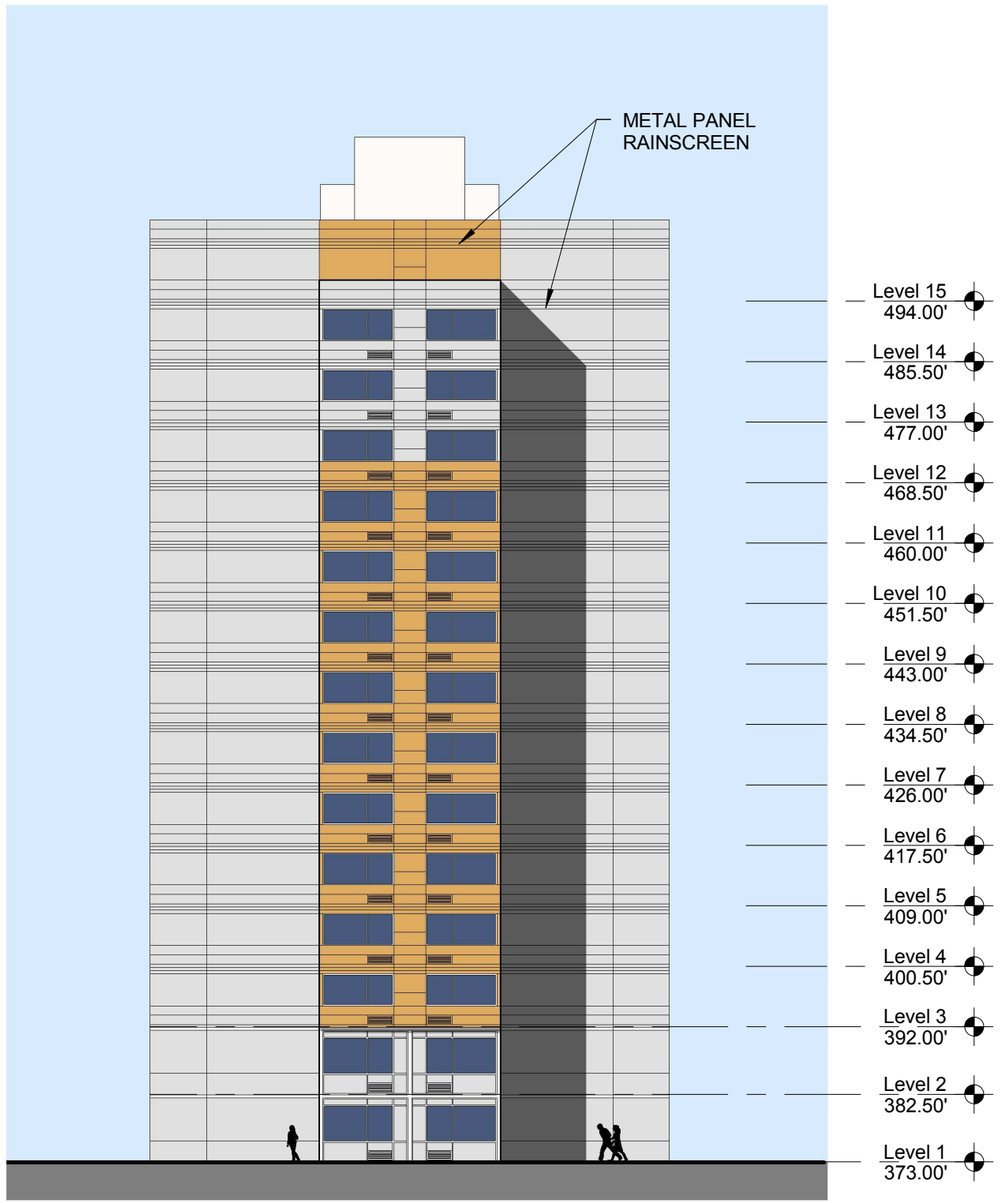
SCHEME C1 - METAL PANEL RAIN SCREEN

TOWER A

DATE: 07/01/14

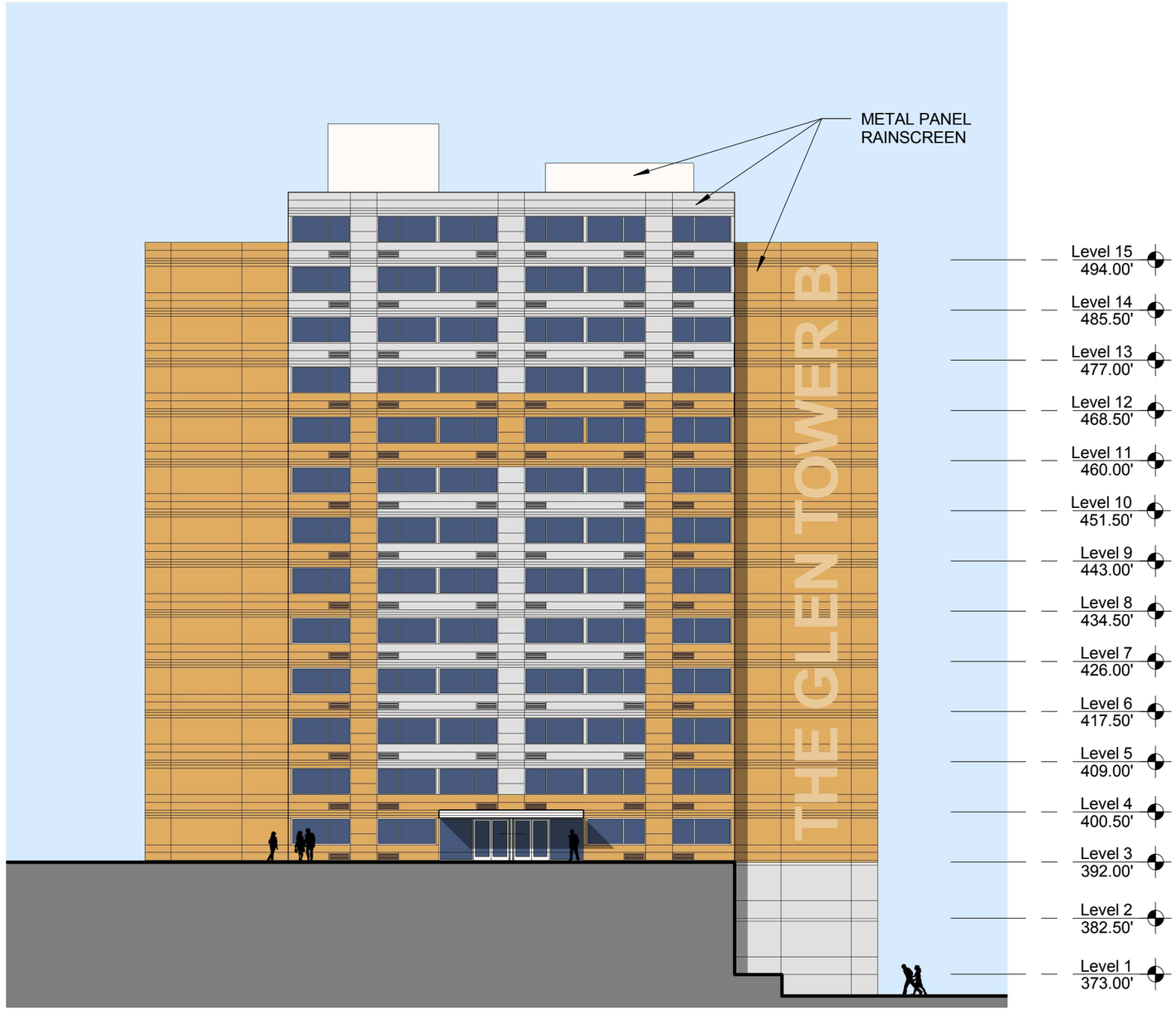
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

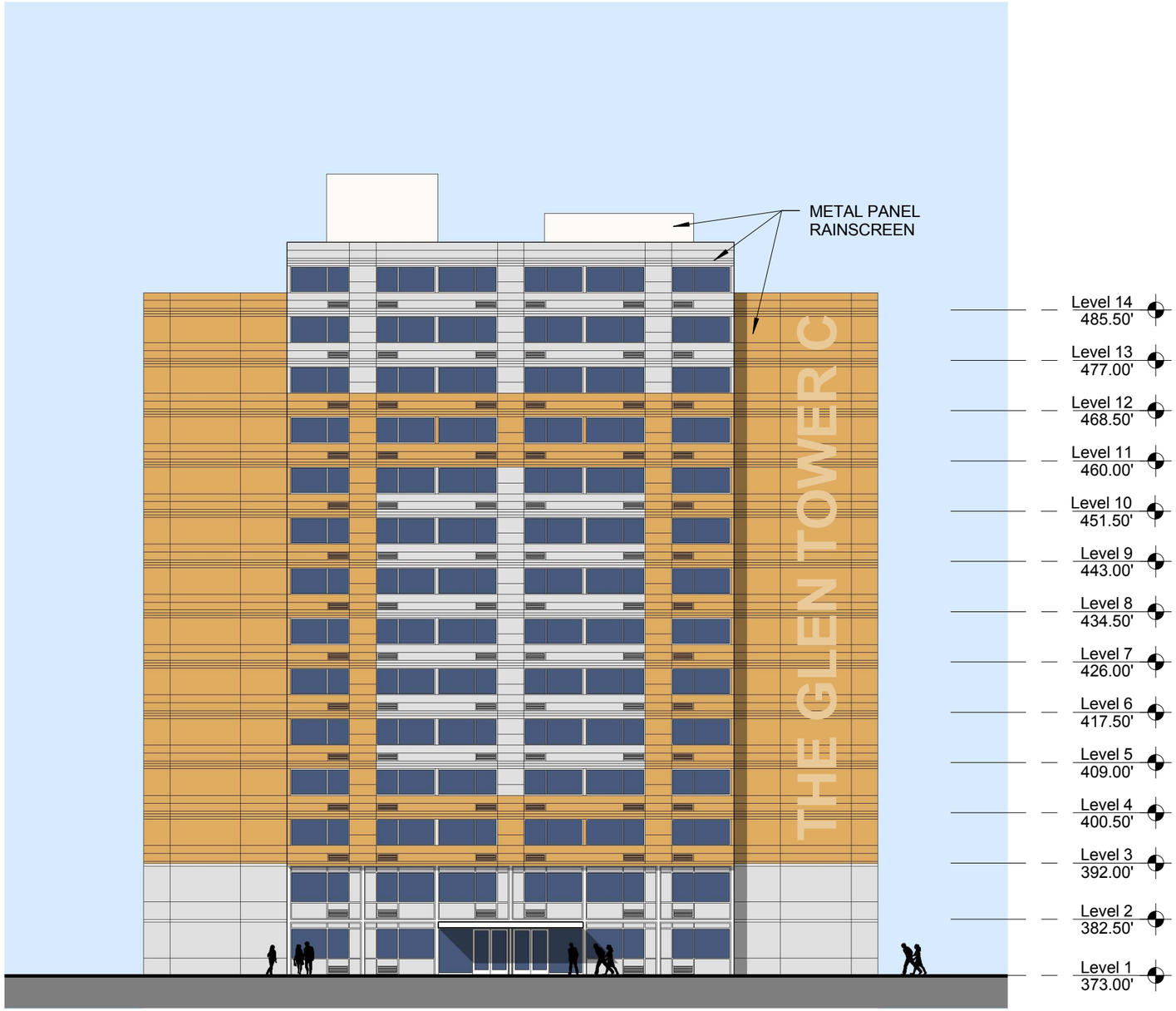
SCHEME C1 - METAL PANEL RAIN SCREEN

TOWERS B + D (SIM)

DATE: 07/01/14

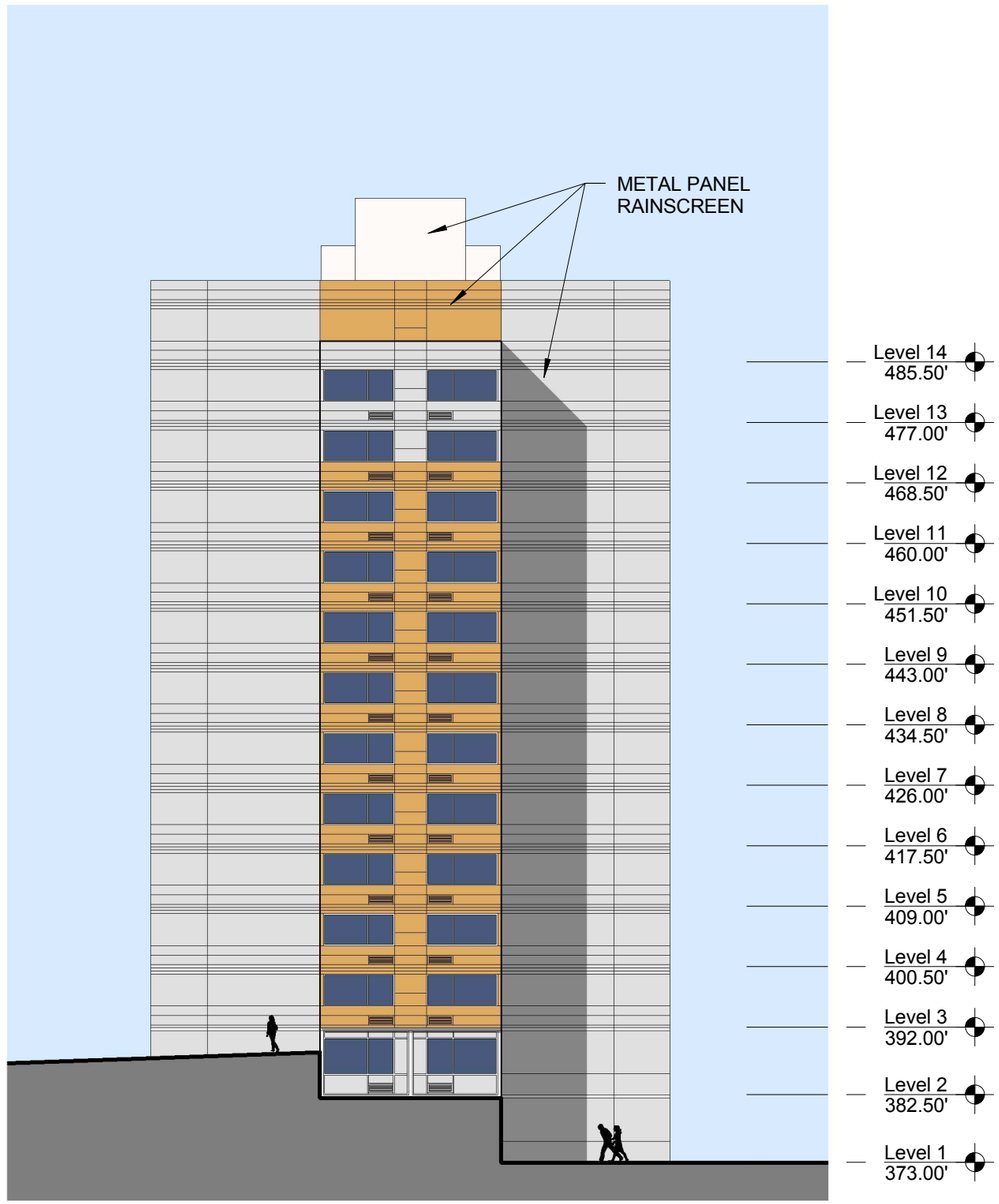
PHASE: SD

G|W
W|O



NORTH ELEVATION

3/64" = 1'-0"



EAST ELEVATION

3/64" = 1'-0"

21'-4" 0 21'-4" 42'-8"

SCALE OF FEET
3/64" = 1'-0"

GLEN TOWERS

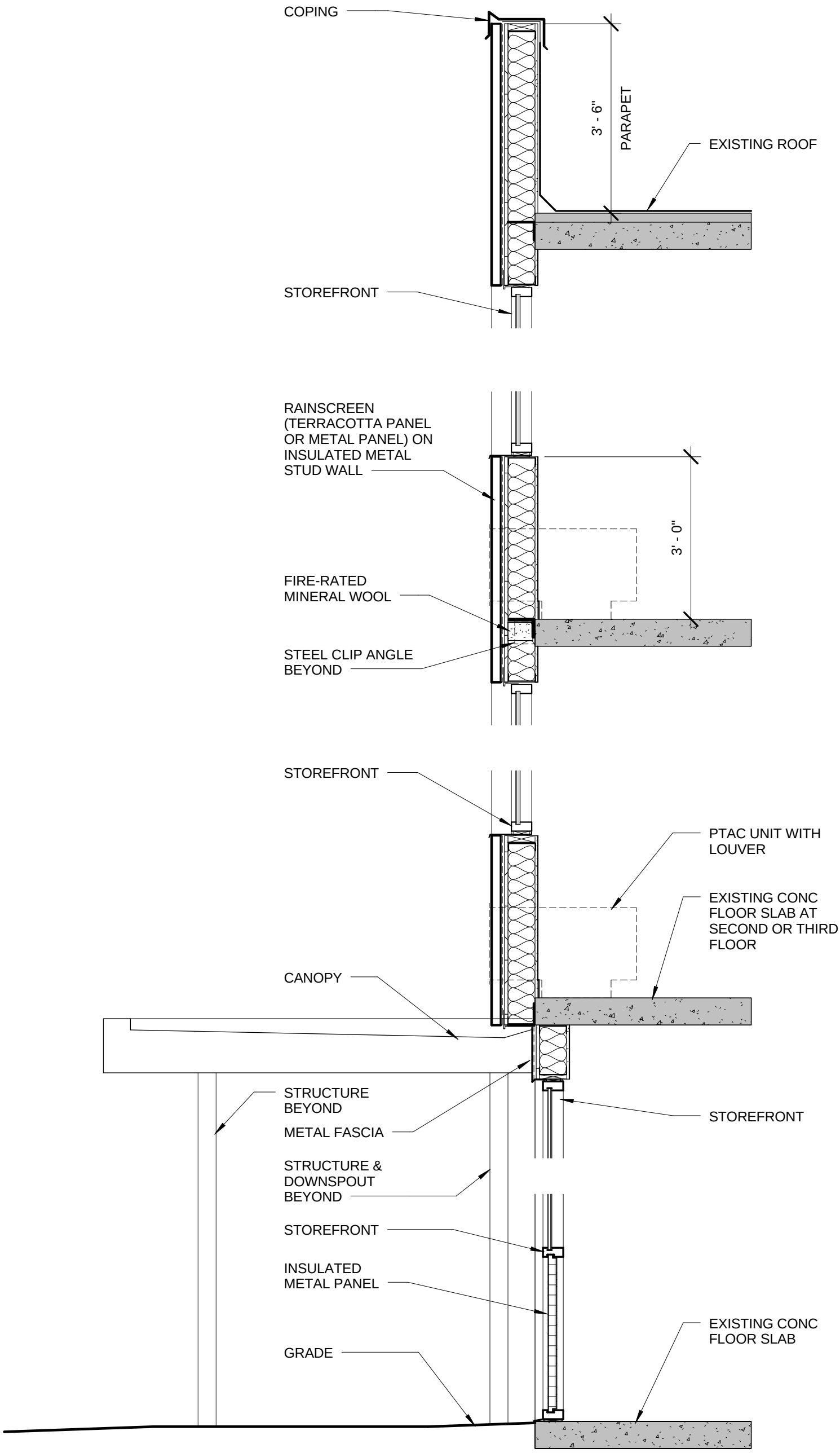
SCHEME C1 - METAL PANEL RAIN SCREEN

TOWER C

DATE: 07/01/14

PHASE: SD

G|W
W|O



WALL SECTION

1/2" = 1'-0"

2 0 2 4

SCALE OF FEET
1/2" = 1'-0"

GLEN TOWERS

SCHEME C1 & C2

WALL SECTION DATE: 07/01/14 PHASE: SD

G W
W O

MECHANICAL SYSTEMS

Packaged Terminal Heat Pumps (PTHPs) – Brand Comparison and Recommendation

Student resident rooms, staff apartments, 1st floor meeting rooms, 1st floor lounges (Buildings A, B and C), 1st floor laundry rooms (Buildings C and D), a 1st floor office (Building D), and a few back-of-house rooms (Buildings C and D) are presently conditioned by packaged terminal air conditioners (PTACs) with electric resistance heat and built-in temperature controls. Per the University's preference, said rooms will be conditioned by new packaged terminal heat pumps (PTHPs) integrated into the above described façade design options. The PTHPs will include electric resistance heat, which will provide full heating in lieu of the heat pump refrigeration cycle at low outdoor air temperatures. The changeover outdoor air temperature varies based on manufacturer and operating conditions. Controls for the new PTHPs will be remote as described below.

Four leading brands of PTHPs were considered and compared; Amana, Friedrich, General Electric and LG. The following is a list of essential features and options that all four include:

- AHRI certified
- Meets or exceeds ASHRAE 90.1-2010 cooling energy efficiency ratio (EER) and heating coefficient of performance (COP)
- Industry standard 42" wide by 16" high wall case and exterior wall grille
- Rotary compressor for reliability and quiet operation
- Cross flow blower for quiet operation
- Separate indoor and outdoor fan motors for efficiency and quiet operation
- Permanently lubricated fan motors
- Slide out chassis
- Upfront, interchangeable, cleanable filters
- Optional extruded aluminum exterior wall grille
- Compressor short cycle protection
- Automatic emergency electric heat
- Automatic power recovery
- High temperature operation protection
- Slinger ring for cooling condensate removal by evaporation from the condenser coil
- Temperature activated drain valve
- Optional condensate drain kit for heating season condensate disposal
- Optional 265 volt electrical sub-base and power connection kit to comply with NEC requirements for direct wiring
- Remote temperature control capability
- Warranty; one year for all parts and labor (Friedrich is two years)
- Limited warranty: five years parts and labor for sealed refrigeration system
- Limited warranty; second through fifth year, parts only for other components

There are also some noteworthy differences between brands. First, heating season outdoor coil defrost in Friedrich units is accomplished by shutting down the refrigeration cycle and allowing defrost to occur naturally. Amana, GE and LG accomplish this by reversing the refrigeration cycle, which reduces defrost time and allows the heat pump to operate at lower outdoor temperatures, thereby reducing electric resistance heating and saving energy. Second, Amana, Friedrich and GE include random unit restart; LG does not. This is a beneficial feature for restart after a building power outage.

Presently, outdoor air for ventilation is not mechanically introduced into the above-stated rooms; neither

directly through the PTACs nor indirectly through the building ventilation system (see "Building Ventilation" below). All four PTHP brands include an outdoor air intake with a concealed lever to manually open or close the intake damper. LG includes an exhaust damper, as well, which automatically opens in conjunction with the outdoor air damper in order to relieve air. This is not desirable since the strategy discussed below is for the outdoor air to provide make-up for bathroom exhaust systems. Outdoor air flows introduced through the brands are as follows:

- Amana: 65 cfm
- Friedrich: 75 cfm
- GE: 45 cfm or 70 cfm (2-position damper)
- LG: Not determined

GE's 45 cfm option is the best choice for most rooms. It satisfies the minimum ventilation requirement (26 cfm for a 260 square foot double occupancy room per 2012 International Mechanical Code /ASHRAE Standard 62.1-2010) with the least impact on heating and cooling loads.

As stated in the features list above, all four brands meet or exceed ASHRAE 90.1-2010 energy requirements, with GE and LG having the highest ratings. The minimum requirements in the ASHRAE standard for units having nominal cooling capacities of 9,000 / 12,000 / 15,000 Btu/hr are 11.3 / 10.4 / 9.5 cooling EER and 3.2 / 3.1 / 2.5 heating COP. Ratings for the four brands are:

- Amana: 11.5 / 10.7 / 9.7 EER; 3.4 / 3.1 / 3.0 COP
- Friedrich: 11.3 / 10.7 / 9.8 EER; 3.3 / 3.1 / 3.0 COP
- GE: 12.7 / 12.1 / 11.2 EER; 3.8 / 3.7 / 3.3 COP
- LG: 12.8 / 11.9 / ** EER; 3.6 / 3.6 / ** COP

** LG does not offer a 15,000 Btu/hr cooling capacity unit at 265 volt, which may eliminate LG from consideration.

Taking all of the above into account and considering its reputation for excellent reliability, the GE Zoneline 6100 series PTHP is the preferred choice. It does have the highest purchase price of the four brands. Based on an online price search, the premium is approximately $150 to $200.The large quantity of units required plus competitive bidding may reduce that differential.

PTHPs – Brand Interchangeability

Although manufacturers have standardized on 42" wide by 16" high wall casing and exterior wall grille size, future replacement of a different manufacturer's chassis and room cabinet utilizing the originally installed wall casing and exterior wall grille is not advised. Configuration of the exterior wall grille must precisely match the chassis configuration to assure that (a) there are no air flow restrictions and (b) there is no short cycling of discharge air into the coil intake. Unfortunately, grille configurations vary between manufacturers. Moreover, the wall casing will be partially exposed inside the rooms; the exterior finish of one manufacturer's room cabinet will not match the exterior finish of a different manufacturer's wall casing.

PTHPs – Condensate Disposal

PTAC and PTHP air conditioning condensate is effectively removed by a "slinger ring," which is a ring around the circumference of the outdoor fan. Condensate water in the unit base pan is lifted by the rotating ring and deposited on the hot outdoor coil, where it evaporates into the exhausted airstream.

There are several options for the disposal of PTHP condensate from the cold outdoor coil during the heating season. The first option is to allow the condensate to flow from the unit base pan through a temperature-activated drain valve into the wall casing. The condensate would drip out through drain holes

in the wall casing and run down the face of the building, including the windows. Also, in time this could result in stain marks on the exterior wall. This option is not recommended.

A second option offered by GE and Amana incorporates a small pump to lift the water from the outdoor portion of the unit base pan to a tray above the indoor coil. The water drips from the tray through the warm indoor coil where most of it evaporates into room atmosphere. Excess water drains back into the base pan. This option minimizes, but does not totally eliminate, water dripping down the face of the building. Moreover, there would be 874 small pumps subject to clogging or failure. This option is also not recommended.

Other options use an accessory internal or external drain kit. The details vary with the different brand units, but the principals are basically the same. The GE external drain kit includes a ½" OD, 90° degree elbow drain tube, gasket and steel mounting plate that fits over the drain hole at one corner of the wall box face so that the externally dripping water is away from the surface of the exterior wall. The kit also includes a gasket and steel mounting plate to seal the drain hole at the opposite corner of the wall box face; wall box overflow drain holes remain open in case of heavy rain and wind. With this method, the wall box would protrude further from the exterior wall, and is therefore not recommended.

The internal drain kit includes a drain connection with gasket and cover plate that mounts to the bottom of the wall box and includes a ½" OD drain tube connection for pipe connection. The kit also includes gaskets and steel mounting plates to seal the two drain holes on the face of the wall box; again, the overflow drain holes remain open. With this option, drain pipe connections would be made to a new pipe riser, which could either spill on grade or connect to existing storm piping at the lowest floor. The riser would have to run inside the residential rooms with Design Options A and B, but could run in the stud space between drywall and batt insulation, or with Design option C, in the cavity between the sheathing and rainscreen. There is one other possibility using the internal drain kit, if Design Option C is selected. A pipe can be run from the drain kit connection of each PTHP through the exterior wall vapor barrier and sheathing, allowing the condensate to drip to grade in the cavity behind the rainscreen. Any of the options using the interior drain kit is recommended, with the last option mentioned being preferred, if the architect does not foresee any adverse consequences

PTHPs – Controls and Electrical Power

Controls for the PTHPs will be a wireless Telkonet system including wall-mounted thermostats and ceiling-mounted occupancy sensors. The "smart" thermostat will be accessible via the Internet, allowing University staff to perform functions such as remotely turning units on/off and changing setpoints. Control functions will including changing to "unoccupied" mode (temperature setback) based on occupancy sensor input or time schedule, e.g. winter break.

The units will include an accessory 265 volt electrical sub-base and power connection kit, which satisfies the NEC requirement for direct wiring of equipment over 250 volts. The sub-base also provides support for the unit.

PTHPs – Energy Analysis for the New Façade Design Options

Each of the three proposed façade design options will result in a significant energy saving over the existing facades due to the greatly improved thermal characteristics of the proposed replacement windows and walls, plus the replacement of PTACs with the higher efficiency PTHPs. However, the energy saving between the three systems is not nearly as significant. With all three schemes, most of the

variables that impact cooling and heating loads are identical; windows, end concrete walls, roof, people, lights, miscellaneous equipment and outdoor air. The only difference between Design Option A and Design Option B is the treatment of the existing exposed edges of the concrete frame. In Option B, those edges are concealed with an insulated aluminum panel curtain wall (R-15). But, the total area of the concrete edges is only approximately 10 square feet per room. And the only difference between Design option C and Design Option B is the increased R value of the frame wall, which includes 6" batt insulation (R-19) between the studs. But the total area of the affected wall is only approximately 50 square feet per room.

For each building and each proposed façade design option, Trane's Trace 700 program was used to model the rooms to be conditioned by the PTHPs, model the PTHP systems, calculate heating and cooling loads, and compute PTHP system annual electrical energy consumption. Program runs were based on the following input. While some input may not be exact, it is consistent for all of the proposed façade design options.

- Cooling conditions: 95°Fdb, 78°Fwb outdoors; 75°Fdb, 50% RH indoors
- Heating conditions: 0°Fdb outdoors; 70°Fdb indoors
- Heating setback temperature (building unoccupied): 55°Fdb
- Windows: PPG Solarban 60 (0.29 U, 0.44 SC)
- Aluminum panel wall and frame walls: See preceding paragraph
- End concrete walls and roof: based on original architectural drawings
- Resident room lighting: 250 watts maximum (various estimates for other rooms)
- Resident room miscellaneous equipment: 800 watts maximum
- Outdoor air: 45 cfm introduced through each PTHP
- Utilization schedules (people, lights and miscellaneous equipment): Developed using best judgment for a college residential hall.
- Year round occupancy except for 4 week winter break
- Room occupancy sensor; Not factored in during school year (will further reduce energy consumption)
- Outdoor air temperature for changeover from heat pump to electric resistance heat: 35°Fdb
- PTHP cooling kw/ton and heating kw/Mbh: Based on GE Zoneline EER and COP
- PTHP indoor fan motor: 30 watts (GE Zoneline)

The following is output from the computer program analysis:

Building	Façade Option	PTHP System Annual Energy Consumption (kwh)
A	A	304,390
A	B	298,264
A	C	298,103
B	A	282,315
B	B	277,448
B	C	276,836
C	A	275,962
C	B	270,643
C	C	270,032
D	A	284,205
D	B	279,607
D	C	278,238

Based on the output, the following is the 4-building total PTHP system annual energy consumption for each façade option, the sum total of present-day annual electrical cost at an estimated $0.10/kwh, and the annual electrical cost savings over baseline Façade Option A:

Façade Option	PTHP System Annual Energy Consumption (kwh)	PTHP System Annual Electric Cost at $0.10/kwh	Annual Electric Cost Savings over Option A
A	1,146,872	$114,687	---
B	1,125,962	$112,596	$2,091
C	1,123,209	$112,321	$2,366

The program output also included individual room loads for all exposures. Based on that data and In response to the University's preference to minimize the unit sizes to be provided, it is recommended that 1 ton cooling capacity PTHPs be installed in rooms under roof and that ¾ ton cooling capacity PTHPs be installed in all other rooms.

Building Ventilation

As a preface, it is noted that the mechanical systems were most likely designed under the 1975 BOCA Mechanical Code, whereas Baltimore County currently is under the 2012 International Mechanical Code, which incorporates ASHRAE Standard 62.1-2010. In the absence of operable windows, both codes require mechanical ventilation with direct supply of air into habitable rooms.

One self-contained rooftop unit (RTU) is provided for each building. The units have two modes of operation; normal mode and emergency smoke control mode. In normal mode, the units provide conditioning for the interior lounge and adjacent storage room on each floor, and for rooms on the lower floors not conditioned by PTACs, i.e. main lobby, reception desk, studies, meeting rooms, offices and laundry rooms. Also, these units are the only source of mechanical ventilation in the buildings. Replacement units were installed on Buildings B and D in 2010 and on Buildings A and C in 2011. RTU replacement drawings dated 12/4/2009 indicate that minimum (normal) outdoor air intake is 1,370 cfm for Building B and 500 cfm for Building D. Provided RTU replacement drawings dated 3/3/2011 do not include an equipment schedule for Buildings A and C. And outdoor air is not indicated on the Trane RTU submittals for those two buildings. According to John Logan, Campus HVAC Systems Manager, there are no known existing air balance reports or other records that would provide that information. Presumably, outdoor air intake for those two RTUs is in the same range as that for the RTUs serving Buildings B and D. Field measurement is the only way to make that determination.

Eight centrifugal power roof ventilators on each building exhaust the building toilet rooms and staff apartment kitchens. (In building C, two 1st floor resident rooms and the shared toilet room were converted to a laundry room. Although the toilet room was demolished, the original exhaust grille still on the wall still exists.) The original mechanical drawings indicate that all fans on all buildings exhaust 1,465 cfm each, which would total 11,720 cfm total per building. However, floor plans indicate 75 cfm exhaust from each toilet room and 120 cfm from the staff apartment kitchen. Based on those numbers, which are code-compliant, there is a major discrepancy on the drawings. The total exhaust for each building should be as follows:

- Building A: 8,745 cfm
- Building B: 8,250 cfm
- Building C: 7,920 cfm
- Building D: 8,025 cfm

One centrifugal power roof ventilator on each building was originally provided to exhaust alternate floor

laundry rooms and kitchenettes, alternate floor janitor closets and a lower floor trash compactor room. Per the "as-built" drawings (contractor mark-ups), the janitor closets were changed to electrical closets, and the designed exhaust grilles and ducts were never installed. In time, the laundry rooms and kitchenettes were converted to storage rooms, except for one room per building, which was converted to a server room. Based on a random check of ex-laundry rooms, it appears that dryer vents, which had been connected to two dryers per room, have been capped off in Building A and left open in Buildings B, C and D. The original mechanical drawings indicate that each fan exhausts 3,150 cfm, of which 2,450 cfm was dryer exhaust and 175 cfm was intended for the janitor closets that were never installed. Given the present state of the systems, it is impossible to know how much air is actually being exhausted without field measuring.

All of the aforementioned exhaust fans appear to be original and presumably operating at original design speed. Nameplate data was non-existent. And according to John Logan, there are no known existing air balance reports or fan submittals available. Based solely on outward appearance and on operating noise, condition of the fans is considered to range from poor to fair.

Other observations regarding building ventilation are:

- Resident rooms and other closed rooms conditioned by PTACs are not mechanically ventilated; current code requirement is 5 cfm/person plus 0.06 cfm/sf floor area (26 cfm for a 260 sf double occupancy room) Any ventilation at all is via infiltration through the exterior wall or through poor seals around the PTACs.
- Make-up air for resident room toilet exhaust relies on the above-described infiltration into the resident rooms. However, the toilet room doors are rather tight fitting and not undercut, which restricts what infiltration there is from transferring into the toilet rooms. Achieving design exhaust flow of 75 cfm per toilet room is suspect.
- Typical floor corridors are not mechanically ventilated; current code requirement for outdoor air is 0.06 cfm/sf floor area. Air supplied to the typical floor lounges from the RTU is directly returned/exhausted from the lounges to the RTU, even when the RTU is in maximum economizer cooling mode (100% outdoor air). Therefore, there is not even any indirect ventilation by transfer of air to the corridors.
- A central laundry room with ten dryers has been added at a lower level of each building. The dryers are exhausted out the through the exterior wall of the room, but make-up air has not been provided. Dryer venting is estimated at 150 to 200 cfm per dryer.
- Electrical closets on each floor are not ventilated and are very hot, especially those which include transformers.
- The server room in each building, which is located on or around the 8th floor, is extremely hot, which may impact server life. The existing ventilation (ex-laundry or ex-kitchenette) is grossly inadequate.

The following are recommendations to improve building ventilation:

1. To satisfy mechanical code ventilation requirements and provide an effective source of make-up air for the exhaust systems, set the manual outdoor air dampers in the new PTHPs in the open position. If the recommended GE Zoneline PTHPs are provided, then the three-position damper should be set to introduce 45 cfm in all resident rooms, staff apartments and private offices; the damper should be set to introduce 70 cfm in the meeting rooms and lounges. (Though it would be preferable to ventilate these rooms and the corridors with a ducted rooftop dedicated outdoor air unit, such is not feasible due to space constraints, structural impacts, and cost considerations.)
2. Undercut all resident toilet room doors ¾" above the floor.
3. Replace all existing power roof ventilators (eight per building) serving the toilet rooms and staff apartment kitchens with new fans properly sized for connected room air flow rates (75 cfm per toilet room, 120 cfm per staff apartment kitchen). Rebalance the systems. Note that existing fans have exceeded normal life expectancy.

4. Retain the existing air supply to the typical floor storage rooms (ex-laundry rooms and ex-kitchenettes), but seal off the exhaust connections. If possible, extend runout ducts from the exhaust riser to new exhaust registers in the typical floor electrical closets (100 cfm per closet). Replace all power roof ventilators (one per building) with new fans sized to meet the new air flow requirements and balance the systems. Seal off floor drains in the ex-laundry rooms to eliminate sewer gas odors due to dry traps.
5. Eliminate the ventilation in the server rooms and provide a ductless DX split air conditioning unit; condensing unit on the roof and wall-mounted fan coil unit in the server room.
6. Re-evaluate minimum outdoor air intake required at each of the four RTUs and rebalance air intake accordingly.
7. Potential typical floor corridor ventilation system requiring more study and design analysis: Provide new variable refrigerant flow (VRF) heat pump system consisting of ducted fan coil units in each typical floor storage room, roof-mounted outdoor unit(s) and interconnecting refrigerant piping. Provide ducted supply and return air from the fan coil units to the corridors. Provide a roof-mounted fan and duct riser in the storage rooms to supply code-compliant outdoor air duct-connected to each fan coil unit. Provide a condensate drain riser from the fan coil units and connect to storm drain piping at the most convenient location below the typical floors. Provide interface with the fire alarm system to shut down the fan coil units and outdoor air supply in any alarm situation. Code-compliant outdoor air (outdoor air fan size) for each building is as follows:
    - Building A: 900 cfm
    - Building B: 780 cfm
    - Building C: 780 cfm
    - Building D: 780 cfm

Although an apparent lack of laundry room make-up air was cited above, there are no known reports of dryer operational problems, which indicates that there actually is sufficient make-up air via building infiltration and/or existing mechanical ventilation. Furthermore, the above recommendations should further lessen any deficiency. Therefore, remedial actions do not seem to be warranted. If dryer operational problems do become an issue, then there appear to be two options. Option one is to provide an exterior wall louver with motorized damper interlocked with the dryers. The serious drawback is the introduction of raw outdoor air into the room. Option two is to provide a dedicated outdoor air unit on grade to duct conditioned make-up air into the room. The unit would only need to be sized to supplement estimated make-up air available from other sources and could take into account dryer use diversity. The feasibility of this option will require further study.

Smoke Removal and Stair Pressurization

As previously stated, the RTUs include an emergency smoke control mode of operation, which according to control sequence notes on the “as-built” drawings, operates as follows (refer to the attached sketch of the typical floor core area showing the existing ventilation system layout and dampers):

- Motorized dampers in every typical floor lounge return air duct connection close. Air supply to those lounges is not interrupted, thereby pressurizing the rooms so that they become an area of refuge.
- A motorized damper in the RTU between the return/exhaust section and supply section closes so that all smoke is exhausted by the unit exhaust fan and not recirculated to the building by the unit supply fan.
- Motorized dampers to the outdoors in the RTU supply air section and return air/exhaust air section open so that the supply fan can supply 100% outdoor air and the exhaust fan can exhaust the smoke.

- Motorized dampers in the corridor supply duct and corridor return duct on the fire floor both open,

while the same dampers on other floors remain closed, thereby supplying outdoor air to and exhausting smoke from the fire floor.

The last bullet point is contrary to typical smoke control systems, in which air is never supplied to the fire floor. Instead, air is supplied to the floor above and below the fire floor in an effort to pressurize those floors relative to the fire floor. Nevertheless, notes on the “as-built” drawing indicate that the design was approved by the authority having jurisdiction. Furthermore, there is a confirming letter from the president of the engineering firm that designed the systems; Henry Kacher (Turbin, Wachter Associates) to Charles Mullan (Mullan Enterprises) dated 11/11/1982. It is questionable whether the installed operation mode would be accepted now. It should be noted that present-day codes no longer require emergency smoke evacuation systems. However, if such are provided, they need to function in an approved manner.

Stair pressurization systems are provided for the two stairways in each building. There are several issues with the design and installation which make it highly unlikely that the systems can meet code requirements to maintain 0.15 in. wg to 0.35 in. wg differential pressure between inside and outside of the stairways, thereby providing a smoke-free escape route from the building.

- Air supply is single injection at the bottom of the stairway. Systems in high rise buildings should be multiple injection with air supplied at every second or third floor.
- The 2,500 cfm, 0.375 in. wg. static pressure pressurization fan appears seems undersized. Air flow should be in the range of 7,000 cfm to 8,500 cfm depending on the number of stairway doors (approximately 500 cfm per door). Static pressure should be approximately 1.0 in. wg.
- Stairway enclosures need to be as airtight as possible. Doors should include weatherstripping, thresholds, and sweeps. Pipe and duct penetrations should be sealed with firestopping.
- Pressurization fans and ductwork installed outside of the stairways are required to be encased in two hour fire-rated enclosures.

It is recommended that the stair pressurization systems be tested to confirm or refute the allegation. If proper pressure cannot be achieved, then remedial actions are required. Possibilities, if feasible, may include adding a second fan on the roof to pressurize the upper half of the stairway and upsizing the existing fan, ductwork and intake louver at the bottom of the stairway.

ELECTRICAL SYSTEMS

The electrical portion of this report addresses the following items of concern based on the universities scope of work document:

1. The existing multi-wire branch circuits serving new PTHP units.
2. The condition assessment of the feeders from main switchboards in each building to the branch circuit panelboards.

PTAC Unit Multi-Wire Circuits

The scope of work includes the replacement of all existing PTAC units with new, higher efficiency PTHP units, which will be connected to the existing branch circuits currently in place. The existing wiring method to most of the units consists of multi-wire branch circuits, which connect to one PTAC; the wiring is carried through that unit and connected to a downstream unit. Each PTAC unit is connected to an individual branch circuit at the designated existing panelboards located in floor electrical closets. The issue is that the recent version of the 2011 National Electrical Code (NEC), specifically NEC 210.7 (B), requires all multi-wire branch circuits connected at a common point to have all of the ungrounded conductors disconnected simultaneously. Currently, each circuit is connected to an individual single-pole circuit breaker.

The resolution to comply with the code, upon the unit replacement, is to have the existing panelboard manufacturer provide manufactured breaker handle ties, which will meet the requirement of the NEC. These are devices which cover the handles of as many as four single pole circuit breakers thus allowing breakers serving a multi-wire circuit to be simultaneously disconnected. The multi-wire circuits will need to be confirmed by the installing contractor, and the handle ties be installed at the time of replacement.

As part and parcel to the scope of work, the existing PTAC units being replaced are cord and plug units, connected to a dedicated receptacle with the units cord and plug being used as the disconnecting means. The NEC no longer recognizes this disconnecting means, and based on Article 440.60 requires "room" HVAC units to be directly connected to the branch circuit.

Branch Circuit Panelboard Feeders

The buildings were constructed in 1982, and the existing distribution system (distribution panels, feeders, panels and transformers) have remained intact with routine maintenance. However, 30 years is a standard time frame for equipment, conductors and such to begin to degrade and outlive their useful life expectancy. The distribution system feeders have two methods of inspection used to evaluate their condition, and more to the point only one reliable method to certify their condition.

Physical inspection of the feeders, which requires removal of the switchboard and branch circuit panel cover to visually inspect the feeders for signs of insulation tearing (based on original feeder pulling) and for spotting small pith holes in the insulation, which could be signs of a partially faulted feeder. However, the most reliable method to certify the conductors condition based on the manufacturers specification is to perform an insulation resistance (IR) test commonly known as a "megger" test. This test will confirm the resistivity of conductor insulation. Each phase and neutral conductor is required to be completely disconnected and cleared of any current prior to administering the test.

The testing should be done by a recognized testing firm. Each feeder recorded and the manufacturer’s value and the test value recorded to confirm the feeder insulation integrity. This testing is time consuming

and quite costly. The testing would have to be done during overnight hours or during periods when students have vacated the buildings during winter or summer breaks. Therefore, the testing would have to be phased over a time period acceptable to the University. It is important to ensure that a reputable, licensed testing company or electrician who offers testing services performs the work. The tester should be required to submit a test procedure outlining the time duration of testing; procedures for exposing surfaces, feeders, etc. for testing; and a back-out plan in the event something goes wrong and the equipment cannot be returned into service. Worst case scenario would be that a feeder has had its insulation compromised and the testing current shorts to another conductor, which damages the insulation of that conductor. Such will be determined by the results of the testing.

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Glen Towers – Façade Improvements

Towson University

Cost Estimate

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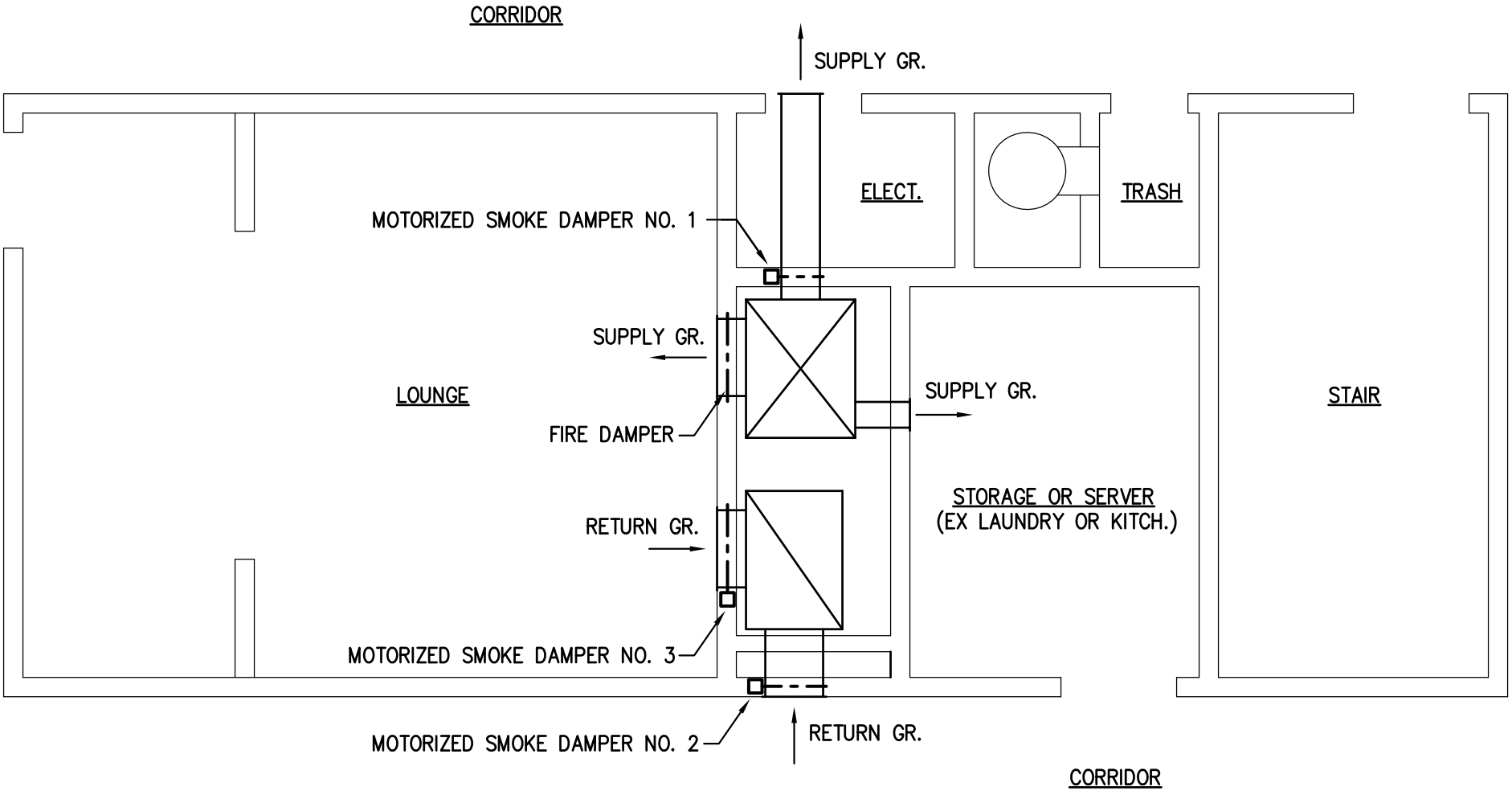
Appendix A: Typical Floor Core Area Existing Ventilation System Diagram



TYPICAL FLOOR CORE AREA
EXISTING VENTILATION SYSTEM

SCALE: 1/4" = 1'-0"

MOTORIZED SMOKE DAMPER OPERATION AS DESIGNED AND INSTALLED

MOT. SMOKE DAMPER	NORMAL MODE POSITION	FIRE MODE POSITION
NO. 1	CLOSED	OPEN ON FIRE FLOOR ONLY
NO. 2	CLOSED	OPEN ON FIRE FLOOR ONLY
NO. 3	OPEN	CLOSED ON ALL FLOORS

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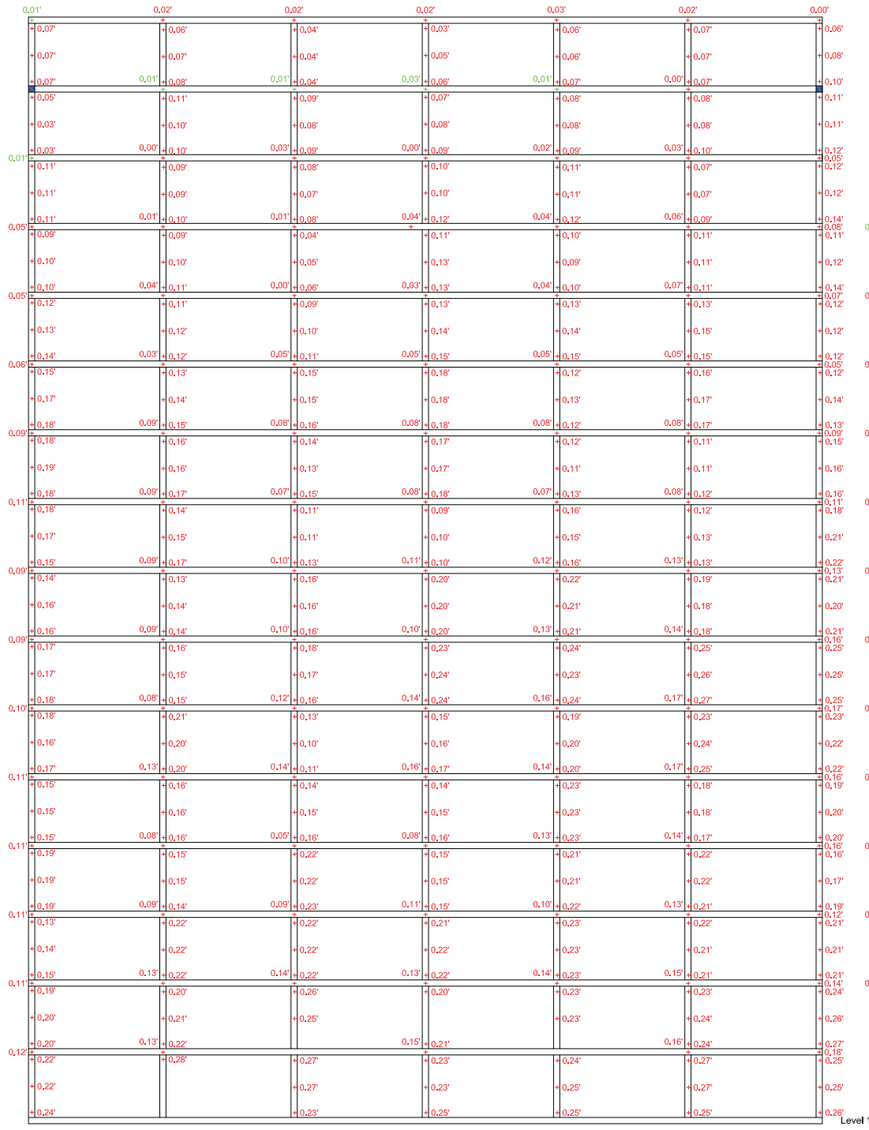
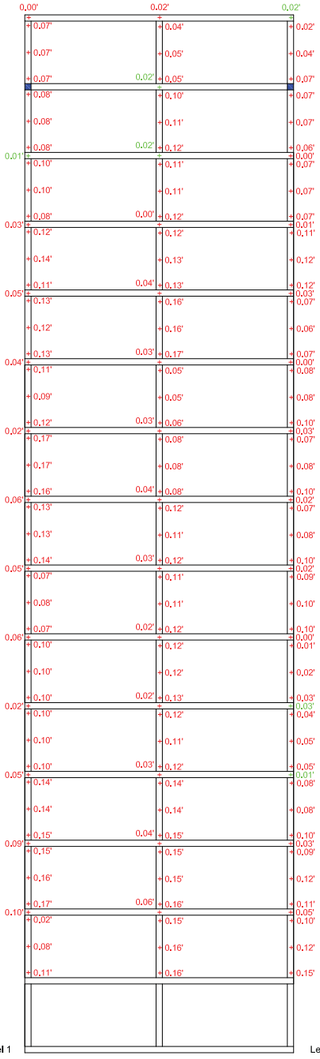
Towson University

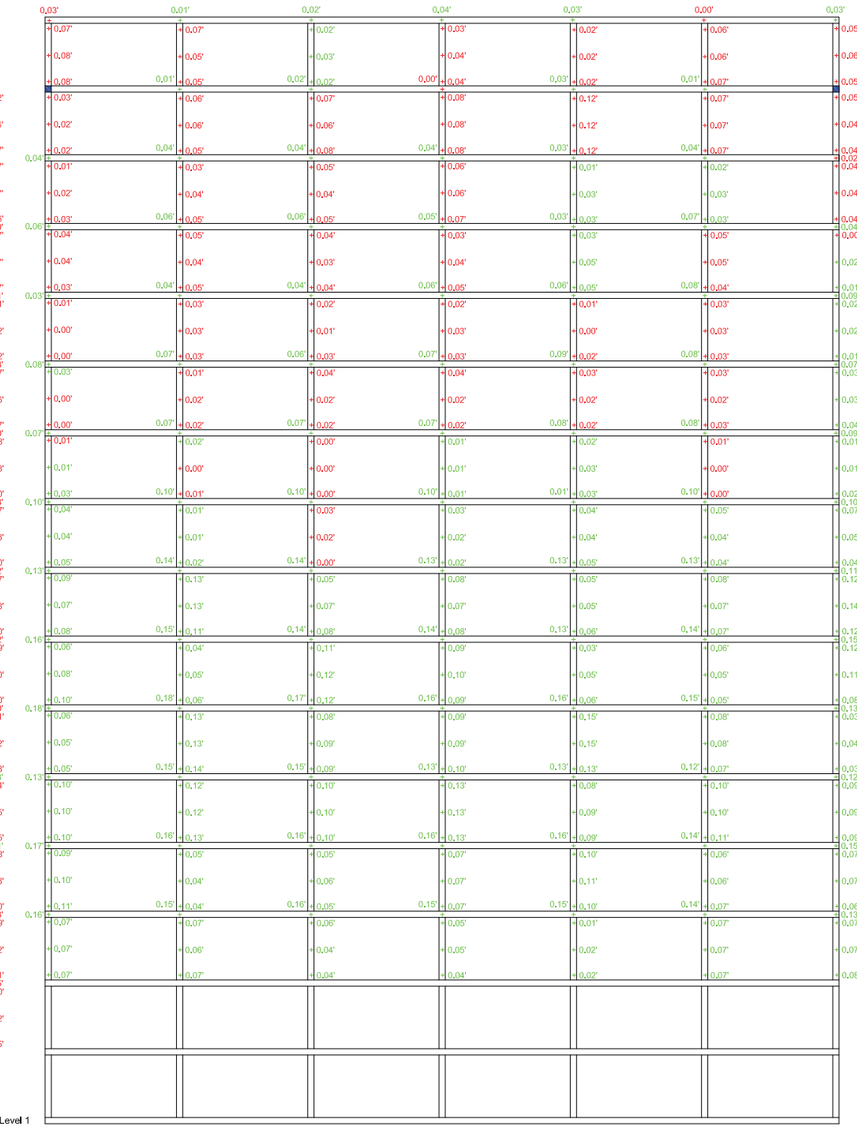
Appendix B: Building Façade Existing Conditions Survey



North



West



South

East

Tower A

The baseline selected for all displayed offsets is a line from a point on the left (elevation view) exterior face of floor slab of the highest enclosed floor, across the face of said floor slab to a point on the right (elevation view) exterior face of floor slab of the highest enclosed floor. These points for establishing the baseline are represented as ■

Offsets in green reflect an inward dimension from the baseline

Offsets in red reflect an outward dimension from the baseline

The data were obtained by means of laser scanning in conjunction with conventional surveying equipment. A Leica MS-50 multistation was used to obtain the scan data. A Leica TS-12 total station and CS-15 field controller were used to obtain data in areas obscured at the time of the scan. Importation of the scan data was performed using Leica Cyclone and both scan and conventional data were viewed and analyzed using AutoCAD Civil3D 2013 in conjunction with Leica Multiworx plug-in software.

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Building Face Existing Conditions Survey

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Tower B

The baseline selected for all displayed offsets is a line from a point on the left (elevation view) exterior face of floor slab of the highest enclosed floor, across the face of said floor slab to a point on the right (elevation view) exterior face of floor slab of the highest enclosed floor. These points for establishing the baseline are represented as ■

Offsets in green reflect an inward dimension from the baseline

Offsets in red reflect an outward dimension from the baseline

The data were obtained by means of laser scanning in conjunction with conventional surveying equipment. A Leica MS-50 multistation was used to obtain the scan data. A Leica TS-12 total station and CS-15 field controller were used to obtain data in areas obscured at the time of the scan. Importation of the scan data was performed using Leica Cyclone and both scan and conventional data were viewed and analyzed using AutoCAD Civil3D 2013 in conjunction with Leica Multiworx plug-in software.

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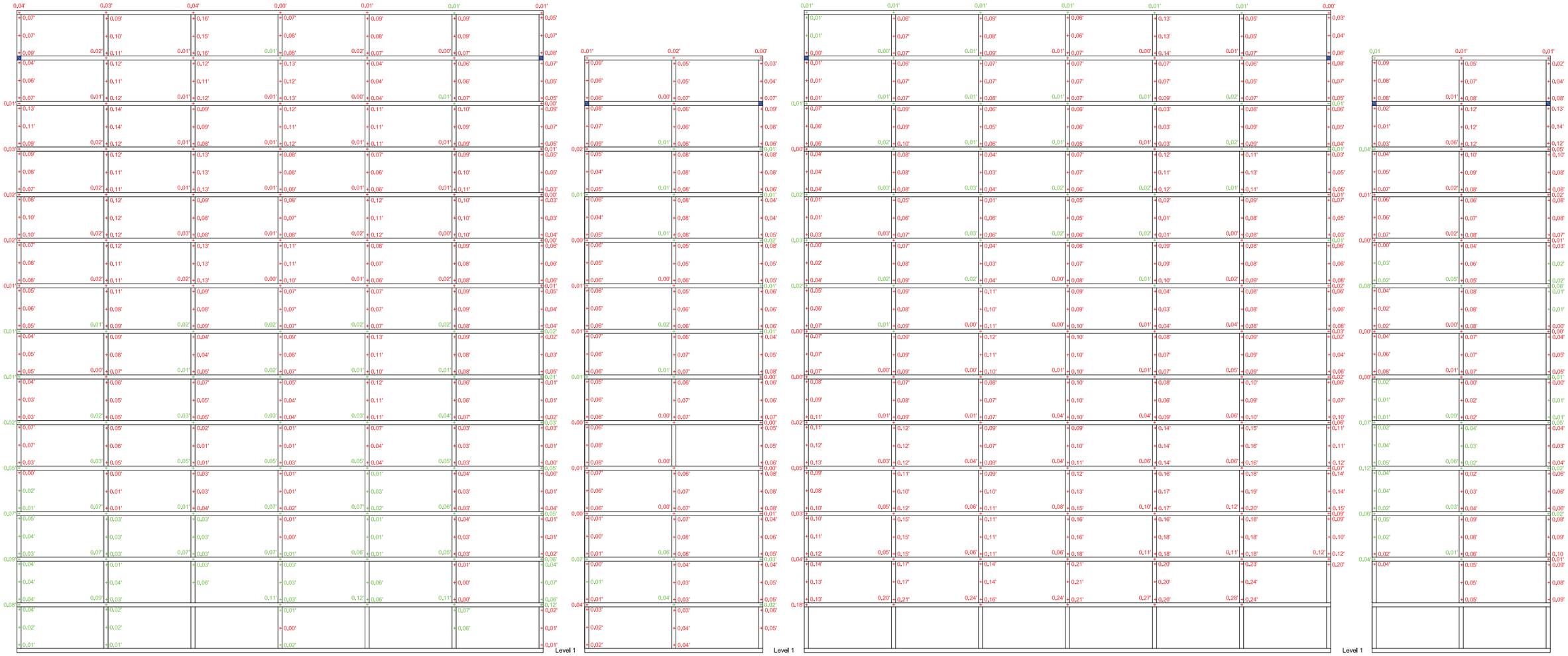

Tower C

The baseline selected for all displayed offsets is a line from a point on the left (elevation view) exterior face of floor slab of the highest enclosed floor, across the face of said floor slab to a point on the right (elevation view) exterior face of floor slab of the highest enclosed floor. These points for establishing the baseline are represented as ■

Offsets in green reflect an inward dimension from the baseline

Offsets in red reflect an outward dimension from the baseline

The data were obtained by means of laser scanning in conjunction with conventional surveying equipment. A Leica MS-50 multistation was used to obtain the scan data. A Leica TS-12 total station and CS-15 field controller were used to obtain data in areas obscured at the time of the scan. Importation of the scan data was performed using Leica Cyclone and both scan and conventional data were viewed and analyzed using AutoCAD Civil3D 2013 in conjunction with Leica Multiworx plug-in software.

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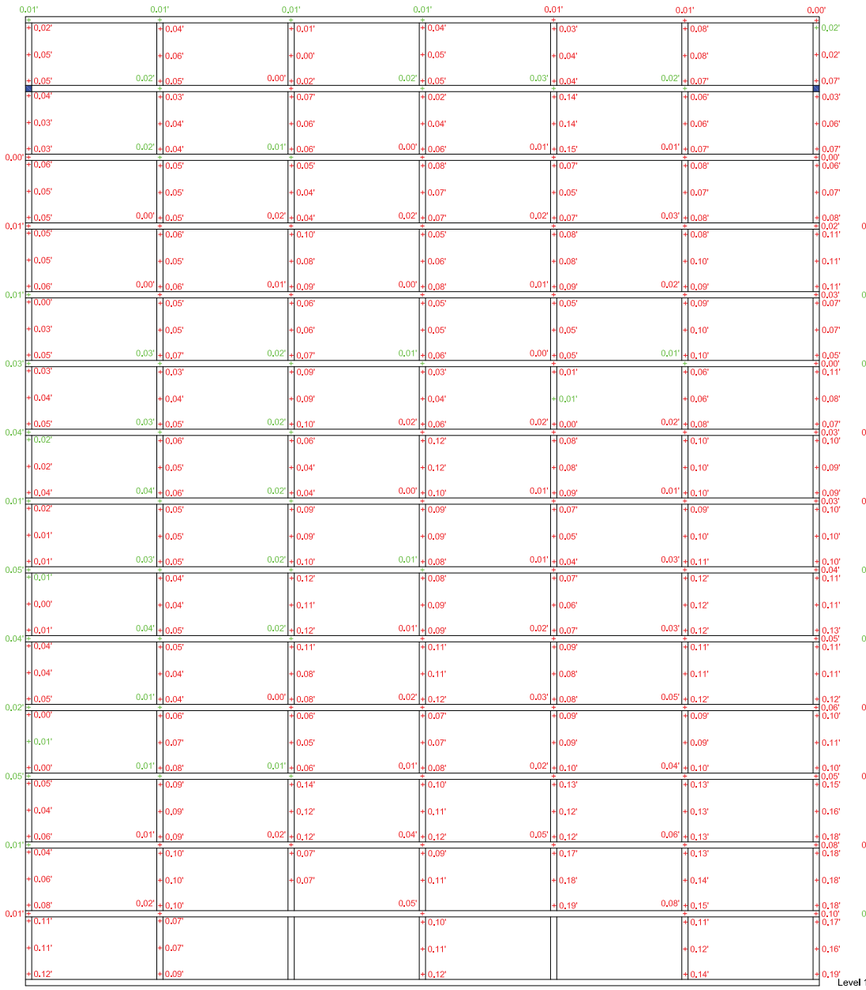
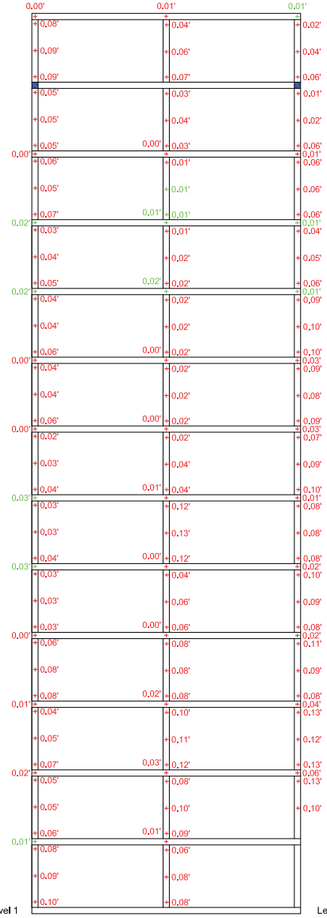
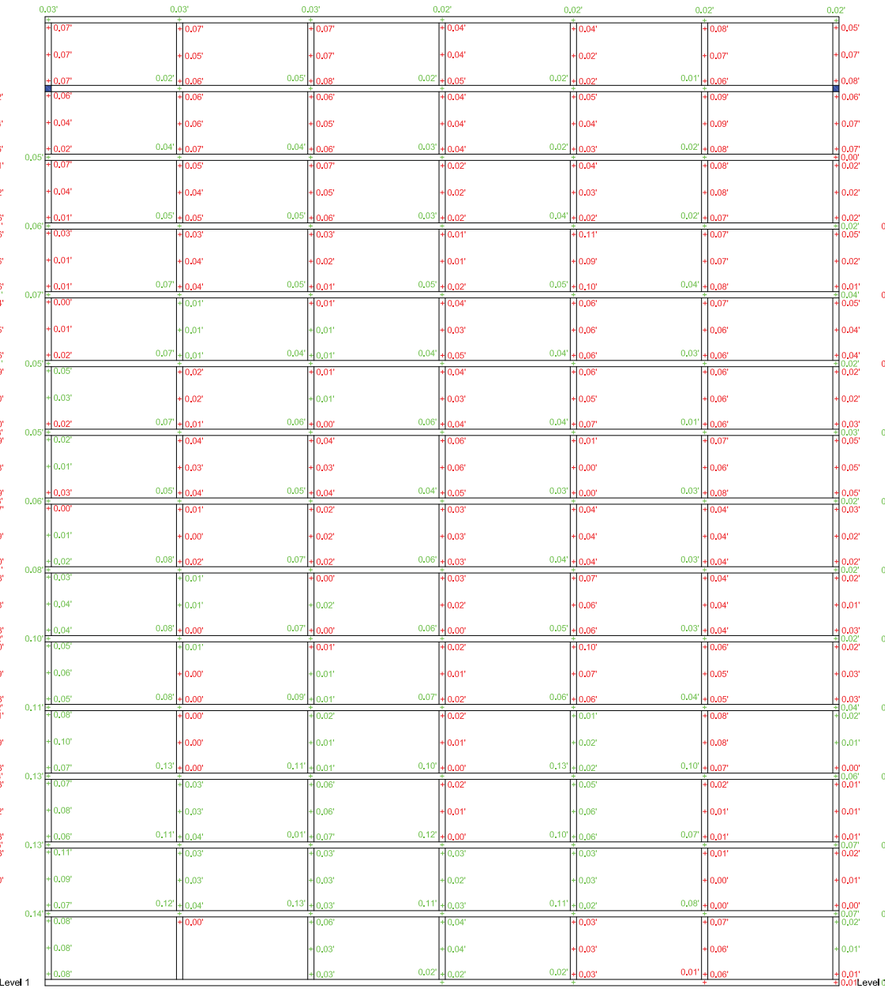


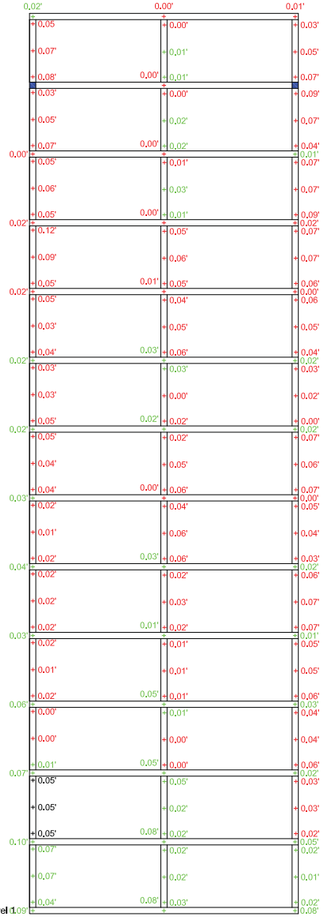
West



South



East



North

Tower D

The baseline selected for all displayed offsets is a line from a point on the left (elevation view) exterior face of floor slab of the highest enclosed floor, across the face of said floor slab to a point on the right (elevation view) exterior face of floor slab of the highest enclosed floor. These points for establishing the baseline are represented as ■

Offsets in green reflect an inward dimension from the baseline

Offsets in red reflect an outward dimension from the baseline

The data were obtained by means of laser scanning in conjunction with conventional surveying equipment. A Leica MS-50 multistation was used to obtain the scan data. A Leica TS-12 total station and CS-15 field controller were used to obtain data in areas obscured at the time of the scan. Importation of the scan data was performed using Leica Cyclone and both scan and conventional data were viewed and analyzed using AutoCAD Civil3D 2013 in conjunction with Leica Multiworx plug-in software.

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Glen Towers – Façade Improvements

Towson University

Product Information

TNEMEC

PRODUCT DATA SHEET

ENVIRO-CRETE® 156 & 157

PRODUCT PROFILE

GENERIC DESCRIPTION Modified Waterborne Acrylate

COMMON USAGE Flexible, breathable coating primarily for concrete and masonry that can fill and bridge minor hairline cracks. Excellent elastomeric protection against driving rain, alternate freezing-thawing and UV light. Series 156 can also be used as a low cohesive stress overcoat for aged oil or alkyd systems.

COLORS Refer to Tnemec Color Guide. Series 156 is also available in 01AB Air Barrier Beige.

FINISH Matte — Series 156: Smooth; Series 157: Sand Texture (TX)

SPECIAL QUALIFICATIONS Series 156 meets air barrier (A.B.) requirements of Massachusetts' Energy Code, 780 CMR Chapter 13.

PERFORMANCE CRITERIA Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS

Concrete, Masonry and Wood: Self-priming or Series 151-1051, 287
Plaster and Stucco: Series 151-1051, 287
Split-Face and Split-Fluted Block: Self-priming or Series 130-6602
Steel: Series 37H, 66, N69, N69F, L69, L69F, 90-97, 94-H_2O, 135, L140, L140F
Galvanized Steel & Non-Ferrous Metal: Series 66, L69, L69F, N69, N69F, 135
Other: Series 151 on treated or stained wood, drywall, highly absorbent surfaces and recommended sound existing coatings.

SURFACE PREPARATION

STEEL Refer to primer product data sheets for surface preparation recommendations.

GALVANIZED STEEL & NON-FERROUS METAL Surface preparation recommendations will vary depending on substrate and exposure conditions. Contact your Tnemec representative or Tnemec Technical Services.

CRACKS Fill hairline cracks less than 1/64 inch (.4 mm) wide by brushing Series 156 into them prior to applying Series 156 or 157 over the entire area to be coated. Most business cards are about 1/64 inch (.4 mm) thick. For cracks wider than 1/64 inch (.4 mm) and/or moving cracks, gaps and expansion joints use Series 152 Tneme-Tape. Refer to Series 152 product data sheet for details. **Note:** Use Series 156 to embed Tneme-Tape prior to topcoating with either 156 or 157.

PAINTED SURFACES Remove chalk and old paint not tightly bonded to the surface. Apply test patch to check adhesion.

ALL SURFACES Must be clean, dry and free of oil, grease, form release agents and other contaminants. Allow new concrete, plaster, stucco and masonry to cure 14 days. Level protrusions and mortar spatter. Bare cementitious surfaces can be slightly dampened with clean water if product is drying too rapidly during application. Series 151 may improve adhesion on smooth surfaces. Reference SSPC-SP13/NACE 6.

TECHNICAL DATA

VOLUME SOLIDS Series 156: 50.9 ± 2.0% Series 157: 55.5 ± 2.0% †

RECOMMENDED DFT Series 156: 4.0 to 8.0 mils (100 to 205 microns) per coat. Series 157: 6.0 to 9.0 mils (150 to 230 microns) per coat.

CURING TIME

Temperature	To Touch	To Handle	To Recoat
75°F (24°C) 50% Relative Humidity	1/2 hour	1-2 hours	1 1/4 hours

Curing time varies with surface temperature, air movement, humidity and film thickness.

VOLATILE ORGANIC COMPOUNDS **Unthinned -** Series 156: 0.41 lbs/gallon (49 grams/litre)
Series 157: 0.38 lbs/gallon (45 grams/litre) †

THEORETICAL COVERAGE Series 156: 816 mil sq ft/gal (19.9 m²/L at 25 microns). Series 157: 890 mil sq ft/gal (21.8 m²/L at 25 microns). Actual coverage will vary from about 100 to 200 sq ft (9.3 to 18.6 m²) per gallon dependent upon product, substrate and coating thickness. †

NUMBER OF COMPONENTS One

PACKAGING Series 156: 5 gallon (18.9L) pails and 1 gallon (3.79L) cans. Yield: 5 gallons and 1 gallon respectively.
Series 157: 5 gallons (18.9L) in a 6-gallon pail and 1 gallon (3.79L) in a 3-gallon pail. Yield: 5 gallons and 1 gallon respectively.

NET WEIGHT PER GALLON Series 156: 11.77 ± 0.25 lbs (5.34 ± .23 kg) Series 157: 13.1 ± 0.25 lbs (5.94 ± .23 kg) †

STORAGE TEMPERATURE Minimum 35°F (2°C) Maximum 110°F (43°C)

TEMPERATURE RESISTANCE (Dry) Continuous 175°F (79°C) Intermittent 185°F (85°C)

SHELF LIFE 12 months at recommended storage temperature.

FLASH POINT - SETA N/A

HEALTH & SAFETY Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

ENVIRO-CRETE® | 156 & 157

APPLICATION

COVERAGE RATES

Series 156

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	6.0 (150)	12.0 (305)	136 (12.6)
Minimum	4.0 (100)	8.0 (205)	204 (18.9)
Maximum	8.0 (205)	16.0 (405)	102 (9.5)

Series 157

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	8.0 (205)	14.5 (370)	111 (10.3)
Minimum	6.0 (150)	11.0 (280)	148 (13.8)
Maximum	9.0 (230)	16.0 (405)	99 (9.2)

Allow for application losses and surface irregularities. Roller or brush application may require multiple coats to obtain recommended film thickness. *Important: Protection against weather, driving rain and alternate freezing and thawing is obtained when coating is applied to form a continuous, void-free film.* The coating must be brushed, rolled or sprayed and backrolled onto block. Grooves in scored and fluted block must be brushed. Two coats are normally recommended for lightweight or haydite block. Split-face and split-fluted block must be filled. Contact your Tnemec representative for specific coating system recommendations. Film thickness is rounded to the nearest 0.5 mil or 5 microns. Film thicknesses are calculated from the sq ft/gal figures. There is no method for accurately measuring the film thicknesses of this coating applied over a rough masonry substrate. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING

Stir contents to a uniform consistency.

THINNING

Not recommended except when priming highly porous surfaces. Thin first coat 30% or 1 1/4 quarts (1.1L) per gallon with potable water.

APPLICATION EQUIPMENT

Series 157 Air Spray

Gun	Fluid Nozzle	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pump•	Fluid Pressure
Graco 204-000	167-330	160-321	3/8" min. (9.5 mm)	1/2" min. (12.7 mm)	40-60 psi (2.8-4.2 bar)	10:1 President Texture Pump	150-300 psi (10.3-20.7 bar)
Binks 7E2	45	1/4" (6.4 mm)	3/8" min. (9.5 mm)	1/2" min. (12.7 mm)	50-70 psi (3.4-4.8 bar)	HF-1200	150-300 psi (10.3-20.7 bar)

• Series 157 is an abrasive material. Short life of fluid section of pumps should be expected. Pump can be replaced with bottom outlet pressure tank such as Binks No. 83-5562 or larger. Adjust pot pressure to 30-40 psi (2.1-2.8 bar).

Series 156 Airless Spray

Pump	Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
Graco 35:1 Senator or larger	0.019"-0.029" (480-735 microns)	2500-3000 psi (172-207 bar)	3/8" (9.5 mm)	30 mesh (600 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Roller: Use a 3/8" to 1-1/2" (9.5 mm to 38 mm) synthetic woven nap roller cover. Use longer nap for rough or porous surfaces. Multiple coats may be required to achieve recommended film thickness, depending on applicator technique and roller nap size.
Brush: Use a good quality nylon or synthetic bristle brush.
Caution: Do not brush and roll Enviro-Crete TX as you would conventional coatings. Instead, use the brush or roller to lay on the Enviro-Crete TX, then lightly smooth down and dress in one direction only. Multi-directional application will cause poor appearance and overworking will cause improper, non-uniform film thickness.

SURFACE TEMPERATURE

Minimum 40°F (4°C) Maximum 100°F (38°C)
The surface should be dry and at least 5°F (3°C) above the dew point.

CLEANUP

Clean equipment immediately after use; brushes and rollers with hot, soapy water; spray equipment as follows:
1. Pump out excess material from equipment and lines.
2. Pump 10 gallons (40L) of clean water through airless pump or conventional pressure tank and lines.
3. Release pressure from pump or pressure tank and clean all parts and surfaces.
4. Reassemble and flush with clean water. Finish with a final flush of ethyl or isopropyl alcohol.

CAUTION!

Dry overspray can be wiped or washed from most surfaces. Satisfactory dry-fall performance depends upon height of work, weather conditions, equipment adjustment and proper thinning. Test for each application as follows: Spray from 15 to 25 feet towards paint container. The material then should readily wipe off. **Note:** Heat can fuse-dry overspray to surfaces. Always clean dry overspray from hot surfaces before fusing occurs. Be aware that exterior surface temperatures can be higher than air temperature. Also, Series 156 has a tendency to show lap marks when spray applied to large, flat surfaces during hot weather. To minimize lap marks stay away from direct sunlight, pre-wet masonry substrates by misting with clean water and lightly backroll with 3/8" nap rollers immediately behind spray application.

† Values may vary with color.

TNEMEC

Enviro-Crete® 156 & 157

Performance Criteria

ADHESION

METHOD: ASTM D 3359, (Method B, Crosshatch).
Coating system cured 7 to 14 days at 75°F (24°C) and 50% R.H.

SYSTEM: 1) One coat Series 156 Enviro-Crete applied to concrete block.
2) Series 130 Envirofill/Series 156 or 157 Enviro-Crete applied to concrete block
3) Series 66 Hi-Build Epoxoline/Series 156 Enviro-Crete applied to SSPC-SP10 Near-White Metal Blast Cleaned steel.

REQUIREMENT: No less than a rating of 5.

FREEZE-THAW

METHOD: ASTM 2246.

SYSTEM: One coat Series 156 Enviro-Crete applied to concrete block and cured 30 days at 75°F (24°C) and 50% R.H.

REQUIREMENT: No cracking over concrete after 15 cycles.

METHOD: ASTM D 2246.

SYSTEM: Two coats Series 157 Enviro-Crete applied to concrete block and cured 14 days at 75°F (24°C) and 50% R.H.

REQUIREMENT: No blistering, cracking or loss of adhesion after 20 cycles.

FUNGAL RESISTANCE

METHOD: ASTM D 3273, 90°F (32°C), 95-98% R.H., suspended 3" above soil containing aspergillus niger, aspergillus oryzae and an unknown species of penicillium.

SYSTEM: Two coats Series 156 or 157 Enviro-Crete applied to drywall panels.

REQUIREMENT: No more than slight mold growth after five weeks exposure.

HUMIDITY

METHOD: ASTM D 4585.

SYSTEM: One coat Series 156 or two coats Series 157 Enviro-Crete applied directly to concrete and cured 7 to 10 days at 75°F (24°C) and 50% R.H.

REQUIREMENT: No blistering, cracking or visible damage after 2,000 hours exposure.

MOISTURE VAPOR TRANSMISSION

METHOD: ASTM D 1653 (Method B), Wet Cup, Condition C at 100°F (38°C).

SYSTEM: Two coats Series 156 Enviro-Crete (free film) 16 mils (405 microns) DFT.

REQUIREMENT: Average 125 grams/metre² in 24 hours.

METHOD: ASTM D 1653 (Method B), Wet Cup, Condition C at 100°F (38°C).

SYSTEM: Two coats Series 157 Enviro-Crete (free film) 16 mils (405 microns) DFT.

REQUIREMENT: Average 305 grams/metre² in 24 hours.

QUV EXPOSURE

METHOD: ASTM G 53 (FS-40 lamps; four hours UV/60°C, four hours CON/50°C).

SYSTEM: One coat Series 156-PA11 Enviro-Crete Alabaster cured seven days at 75° (24°C) and 50% R.H.

REQUIREMENT: No blistering, cracking or chalking. No more than 3.5 MacAdam units color change after 4,000 hours exposure.

METHOD: ASTM G 53 (FS-40 lamps; four hours UV/60°C, four hours CON/50°C).

SYSTEM: One coat Series 157 Enviro-Crete Alabaster cured seven days at 75°F (24°C) and 50% R.H.

REQUIREMENT: No blistering, cracking or chalking. No more than 3.0 MacAdam units color change after 4,000 hours exposure.

SALT SPRAY (FOG)

METHOD: ASTM B 117.
SYSTEM: One coat Series 156 Enviro-Crete applied to concrete block and cured 7 days at 75°F (24°C) and 50% R.H.
REQUIREMENT: No blistering, cracking or delamination of film. No visible damage to coating or substrate after 2,000 hours.

METHOD: ASTM B 117.
SYSTEM: Two coats Series 156 Enviro-Crete applied to concrete block and cured 30 days at 75°F (24°C) and 50% R.H.
REQUIREMENT: No blistering, cracking or delamination of film. No visible damage to coating or substrate after 5,000 hours.

METHOD: ASTM B 117.
SYSTEM: Two coats Series 157 Enviro-Crete applied to concrete block and cured 14 days at 75°F (24°C) and 50% R.H.
REQUIREMENT: No blistering, cracking or delamination of film. No visible damage to coating or substrate after 2,000 hours.

TENSILE STRENGTH & ELONGATION

METHOD: ASTM D 2370.
SYSTEM: Two coats Series 156 Enviro-Crete cured 14 days at 75°F (24°C) and 50% R.H.
REQUIREMENT: Elongation no less than 200 percent, average of five tests. Tensile strength no less than 250 psi (1.7 MPa), average of three tests.

METHOD: ASTM D 2370.
SYSTEM: Two coats Series 157 Enviro-Crete cured 14 days at 75°F (24°C) and 50% R.H.
REQUIREMENT: Elongation no less than 40 percent, average of five tests. Tensile strength no less than 240 psi (1.65 MPa), average of three tests.

WIND DRIVEN RAIN RESISTANCE

METHOD: TT-C-555B, Section 4.4.7.3.
SYSTEM: Two coats Series 156 or 157 Enviro-Crete applied to concrete block and cured 7 or 10 days respectively at 75°F (24°C) and 50% R.H.
REQUIREMENT: No damage to coating or substrate. No visible moisture on the back of lightweight block after 48 hours exposure.

This product will meet or exceed the above test requirements established for the coating systems listed. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating. Published technical data is subject to change without notice. The online catalog at www.tnemec.com should be referenced for the most current technical data and instructions. For additional performance criteria and specific test results, contact Tnemec Company or its representative.

PROJECT PROFILE

Featured Products

Series 151-1051 Elasto-Grip FC
Series 156 Enviro-Crete

Several high-profile office buildings in Washington, D.C., have been renovated with Tnemec protective coatings to renew their curb appeal. The building at M Street and Connecticut Avenue (upper photo) and the building at I and 17th Streets (lower photo) were two of these buildings.

Washington, D.C., Office Building Renovations

In the highly competitive business district of Washington, D.C., property owners understand the importance of commercial curb appeal in attracting tenants, which is one reason they specify masonry coatings from Tnemec for exterior maintenance of high-profile office buildings. "Standard latex acrylic coatings that are typically used on these buildings don't perform well," Tnemec coating consultant Todd Guntner explained. "They tend to break down with the freeze-thaw cycling issues that you have in eastern Mid-Atlantic states. These buildings require a coating system that won't crack, chip or peel under freeze-thaw conditions."

Guntner cited the example of a 12-story office building at 1101 L Street NW, where a two-coat masonry system was specified for exterior aggregate panels as part of a renovation project in the early 1990s. The uncoated panels were power-washed with a biodegradable cleaner and primed with Series 151-1051 Elasto-Grip FC, a waterborne modified polyamine epoxy used for sealing masonry substrates. The topcoat was Series 156 Enviro-Crete, a flexible, breathable waterborne acrylate that offers excellent elastomeric protection against driving rain, alternate freezing and thawing and ultraviolet (UV) light. The project required approximately 1,500 gallons of coatings, which were brushed and rolled. "The coating system looks great after all these years," Guntner observed. "And these coatings are very low-VOC (volatile organic compound) products."

The L Street project led to the same coating system being specified for other high-profile commercial properties at M Street and Connecticut Avenue and I and 17th Streets in Washington, D.C. Uncoated aggregate panels on the Connecticut Avenue building had become discolored over the years from window-washing chemicals and street pollution. "The building's owner had tried power-washing the panels, but cthey were still stained, so they coated them with Series 151 and Series 156," Guntner noted.

The I Street project involved a masonry substrate that was coated 15 years earlier with an epoxy coating that was losing its color. After the coated substrate was power-washed with a biodegradable cleaner, it was primed and topcoated by the coating contractor, Metro Painters, Inc. In addition to sealing cementitious and other porous substrates, Series 151 is an excellent tie-coat over sound existing coatings.

"The 1001 L Street project has led to a number of other owners specifying this coating system because of its performance," Guntner noted.

Project Name
Washington, D.C., Office Building Renovations

Project Location
Washington, D.C.

Project Completion Date
1993

Owner
Blake Real Estate
Washington, D.C.

Architect
Shalom Baranes Architects
Washington, D.C.

Field Applicator
NLP Enterprises
Owings Mills, Maryland

PROJECT PROFILE

Featured Products

Series 63-1500 Filler & Surfacer
Series 66 Hi-Build Epoxoline
Series 70 Endura-Shield
Series 83 Ceramlon II
Series 90E-92 Tneme-Zinc
Series 104 H.S. Epoxy
Series 130 Envirofill
Series 151 Enviro-Prime
Series 156 Enviro-Crete

The Tnemec coatings installed in 1990 at the Aquarium of the Americas in New Orleans continue to provide long-term protection.

Aquarium of the Americas

When architects of Aquarium of the Americas went fishing for the latest coating technology, they succeeded in landing a selection of products from Tnemec that provided both long-term protection and outstanding aesthetics. "The architects were aware that Tnemec coatings had been used on other aquarium projects," according to Tnemec coating consultant Bill Lomasney. "The importance of high quality coatings to the project was recognized early on and Tnemec was actively involved in preparing coating specifications for major exhibits, exterior steel and masonry, Life Support equipment, structural steel and piping."

Wherever exposure conditions, aesthetics, service life or other demands required special coating systems, specifications were written around Tnemec products with specific preparation and dry film thickness (DFT) requirements. Such areas included:

- The Gulf of Mexico and Mississippi River galleries where surfaces were prepared by abrasive blasting and voids were filled with Series 63-1500 Filler and Surfacer, a modified amine epoxy, followed by a finish coat of Series 104 H.S. Epoxy, a cycloaliphatic amine epoxy.

- Interior and exterior steel commercial blast-cleaned in accordance with SSPC-SP6/NACE 3 was primed with Series 90E-92 Tneme-Zinc, an inorganic zinc-rich ethyl silicate, followed by an intermediate coat of Series 66 Hi-Build Epoxoline, a polyamide epoxy, and a topcoat of Series 70 Endura-Shield, an aliphatic polyester polyurethane.

- Interior concrete was cleaned, dried and filled with Series 130 Envirofill, a cementitious acrylic, followed by a coat of Series 83 Ceramlon II, a ceramic-like modified amine epoxy.

- Exterior masonry was cleaned, dried and primed with Series 151 Enviro-Prime, a waterborne modified polyamine epoxy, followed by two coats of Series 156 Enviro-Crete, a modified waterborne acrylate. "Enviro-Crete was selected because of its long-term durability," Lomasney noted.

"The majority of these special coatings remain in service after nearly 20 years of exposure," Lomasney added.

Located along the banks of the Mississippi River near the historic French Quarter, the Aquarium of the Americas opened in 1990. The Mississippi River gallery featured catfish, paddlefish and alligators; the Caribbean Reef featured a clear, 30-foot-long tunnel surrounded by aquatic creatures; and the Gulf of Mexico featured sharks, sea turtles and stingrays.

Project Name
Aquarium of the Americas

Project Location
New Orleans, LA

Project Completion Date
1990

Owner
Audubon Institute, New Orleans, LA

Architect
The Bienville Group, New Orleans, LA

Field Applicator
Custom Coatings, Inc., Baton Rouge, LA

PROJECT PROFILE

Featured Products

Series 156 Enviro-Crete
Series 157 Enviro-Crete

Series 157 Enviro-Crete provides protection for the exterior of Assembly Hall in Bloomington, IN.

Assembly Hall

Assembly Hall in Bloomington, Indiana, is certainly one of the most widely known athletic facilities in collegiate sports. Home to the Hoosiers, who trail only UCLA and Kentucky in the number of NCAA Championships, the Indiana University facility first opened its doors during the 1971-72 season, and currently has the capacity to house more than 17,000 basketball fanatics per game.

In 1999, when the exterior of Assembly Hall was beginning to increasingly show its age, Tnemec coating consultant Jeff Parish recommended a rehab coating system that would provide a proper blend into the existing exterior.

The exterior surface was prepared in accordance with SSPC-SP13/NACE No. 6 Surface Preparation of Concrete. Series 156 Enviro-Crete, a smooth texture, flexible, breathable waterborne acrylate with excellent protection against driving rain and alternate freezing and thawing, was applied to the exterior pre-cast. Series 157 Enviro-Crete, a sand-textured waterborne acrylate, was applied as the coating system's roller-applied topcoat.

Series 157 was chosen because the sand texture would hide imperfections in the concrete caused by the harsh freeze-thaw cycles often encountered in the state of Indiana.

"There is a lot of history in Assembly Hall," said Parish. "We were happy to be a part of the project, and the contractor did a great job applying the coating system."

Project Name
Assembly Hall

Project Location
Bloomington, IN

Project Completion Date
September 1999

Owner
Indiana University

Engineer
Arsee Engineers,
Indianapolis, IN

Field Applicator
Odle Painting, Muncie, IN

PROJECT PROFILE

Featured Products

Series 156 Enviro-Crete

Series 156 Enviro-Crete, a modified waterborne acrylate coating, protects the stucco exterior at the Four Seasons Resort in Scottsdale, AZ.

Four Seasons Resort

Located in the high Sonoran Desert, the Four Seasons Resort in Scottsdale is no stranger to sun-drenched days in the triple digits, which is why the project's architect specified an exterior protective coating system from Tnemec that can take the heat. "The architect was familiar with Tnemec and its reputation and knew what was needed on the project," recalled Tnemec coating consultant Teri Hand. "Prior to that time a Tnemec coating consultant in California was doing a lot of work with Series 156 Enviro-Crete in the Hollywood area, and his experience helped us with the Four Seasons Resort project."

The exterior of the 210 guestroom resort required two coats of Series 156 Enviro-Crete, a modified waterborne acrylate coating for concrete and masonry, which can fill in and bridge minor hairline cracks when applied properly and provides excellent protection against ultraviolet light. The stucco surface was prepared in accordance with SSPC-SP13/NACE No. 6 Surface Preparation of Concrete, which requires that the substrate to be treated is sound, dry and free of contaminants which can affect the penetration of the coating. "The stucco surface was prepared utilizing high pressure water to establish a clean, dry and sound substrate for proper adhesion," according to Hand.

The field applicator spray-applied the two coats of Enviro-Crete at 7.0 mils dry film thickness (DFT) per coat. "We ended up doing most of the work in the evening and early morning when the temperatures were cooler," Hand noted. "Enviro-Crete bonded to the substrate and worked very well once proper painting techniques were developed by the applicators for this unforgiving desert environment. Using a cross-hatch spray pattern, and keeping a wet edge during application, provided the aesthetically pleasing finish the owner and architect were expecting."

With support from Tnemec's technical service department, Hand and the architect worked closely with contractors and applicators throughout the project, which was completed in 2001. "It was a challenging project, but that was why this coating was important and the architect knew it," Hand added. "Today, the project still looks beautiful. It's holding up wonderfully and the resort has even specified the same coating system be used on a new addition."

The Four Seasons Vacation Club, representing an additional 130 units, operates as a natural extension of the resort's hacienda and 25 casitas buildings.

Project Name
Four Seasons Resort

Project Location
Scottsdale, AZ

Project Completion Date
January 2001

Owner
Four Seasons Hotel Company, Down Mills, Canada

Architect
Hill Glazier Architects, San Francisco, CA

Field Applicator
R.M. Hasson, Inc., San Diego, CA

PROJECT PROFILE

Featured Products

Interior Cell Walls:
Series 130 Envirofill
Series 84 Ceramlon ENV
Series 113 H.B. Tneme-Tufcoat

Interior Metals:
Series 66 Hi-Build Epoxoline
Series 161 Tneme-Fascure
Series 73 Endura-Shield

Exterior:
Series 156 & 157 Enviro-Crete

Tnemec coatings were used on both the interior and exterior of the North Branch Correctional Institution in Cumberland, MD.

North Branch Correctional Institution

Located in Cumberland, Md., the North Branch Correctional Institution is a maximum-security state correctional facility that underwent a multi-phased expansion in 2005. Once completed, the project provided four 69,000-square-foot housing units, each with 256 cells spread out over two floors. For the building interior, Richard Craft, Project Manager, Maryland Division of Capital Construction Facilities Maintenance, knew the facility required a durable, low-maintenance coating that could withstand daily wear and tear and abuse from the residents, eliminating downtime during cell repair. Having worked with Tnemec products with much success since 1988, Murphy contacted local Tnemec coating consultant Todd Guntner.

With those requirements in mind, Guntner worked closely with Murphy to develop a coatings system. For the interior cell walls, he specified Series 130 Envirofill, a waterborne cementitious acrylic block filler, as the primer and Series 84 Ceramlon ENV, a ceramic-like modified aliphatic amine epoxy coating that provides excellent protection and easy cleaning, as the intermediate coat. For the topcoat, Guntner specified Series 113 H.B. Tneme-Tufcoat, a high-performance stain-, abrasion-, and chemical-resistant waterborne acrylic epoxy. Murphy particularly liked the satin finish of Series 113; he wanted to avoid using a high-gloss finish that might cause a reflective glare which could irritate the correctional officers' eyes in an already stressful environment.

On the building exterior, Guntner specified Series 156 & 157 Enviro-Crete, an elastomeric, breathable concrete and masonry coating that provides excellent protection against driving rain, freeze-thaw and UV light.

This project provided North Branch Correctional Institution with space- and cost-effective housing units. "We want to avoid vacating the cells during repair and repainting, rendering them uninhabitable," says Murphy. "When this happens, the facility operates at less than maximum capacity."

Project Name
North Branch Correctional Institution (Phase III)

Project Location
Cumberland, Md

Project Completion Date
December 2005

Owner
Maryland Department of Public Safety and Correctional Services Authority

Architect
DMJM Harris, Baltimore, MD

General Contractor
Dick Corporation, Pittsburgh, PA

Applicator
T. D. Patrinos Painting & Contracting, Bethel Park, PA

PROJECT PROFILE

Featured Products

Series 90-97 Tneme-Zinc
Series 135 Chembuild
Series 151-1051 Elasto-Grip FC
Series 156 Enviro-Crete
Series 1070 Fluoronar

Series 156 EnviroCrete, a breathable coating with excellent elastomeric properties, was chosen to help restore the exterior of the historic Paxton Building in Omaha, NE.

The Paxton Building

What once stood as one of Omaha's elite hotels was anything but when developer/owner Shamrock Development purchased The Paxton Building in 2003. Today, the building is home to office and retail space on the first two floors and 10 residential floors featuring luxury condominiums ranging from 1,100 to 3,400 square feet, including penthouses complete with 16-foot ceilings.

Restoring the beauty and architectural detailing of the Paxton was a goal of the owners from the beginning of the project. Built in 1882, the hotel had played host to a number of historic figures in its history including "Buffalo" Bill Cody, William Jennings Bryan and presidents William McKinley, Woodrow Wilson and Theodore Roosevelt. The original Paxton was razed in 1928 and rebuilt the next year into a 420-room hotel. Later home to the Women's Job Corps, it was a hotel again in the late 1960s, but became Paxton Manor, a self-care retirement home, in 1975.

Prior to the current restoration, the Paxton stood unused and unkempt for several years. Moisture damage to the building, particularly to the southern and western sides, was significant. The owners wanted protective coatings that would minimize future problems.

The weathered brick exterior was power washed and received a coat of Series 151-1051 Elasto-Grip FC, a waterborne modified polyamine epoxy, applied at 0.7 to 1.5 mils DFT. Two coats of Series 156 Enviro-Crete, a modified waterborne acrylate, were then applied at 4.0 to 8.0 mils DFT per coat. Chosen for its flexibility and color retention, Series 156 was a great choice, particularly for the southwestern side of the structure that would absorb the most weather, be it rain or sunshine.

Series 90-97 Tneme-Zinc, a zinc-rich urethane primer, was applied to the building's exterior steel, followed by an intermediate coat of Series 135 Chembuild, a polyamidoamine epoxy, and a topcoat of Series 1070 Fluoronar, a high-solids fluoropolymer coating. Series 1070 was chosen for its durability as well as its outstanding gloss and color retention for the areas that feature large, ornate canopies original to the building, which the owners were especially interested in highlighting to bring the property back to its former glory.

Downtown Omaha, where the Paxton Building is located, is undergoing a tremendous revival and this project only enhances the landscape and value of the surrounding area and the city in general.

Project Name
The Paxton Building

Project Location
Omaha, NE

Project Completion Date
May 2006

Owner
Shamrock Development

Architect
RDG, Omaha, NE

Applicator
Frank McGill, Omaha, NE

Construction Manager
C L Enterprises, Omaha, NE

PROJECT PROFILE

Featured Products

Series 151-1051 Elasto-Grip FC
Series 156 Enviro-Crete

Series 156 Enviro-Crete, a durable coating for exterior masonry substrates, protects the City of Lavergne, TN Library.

City of Lavergne Library

Don't tell the people of Lavergne, Tennessee, that the general population isn't reading books as much as it used to. In Lavergne, more than 27,000 people have library cards which enable them to check out any of the 63,000-plus items the library catalogs and make use of the services and programs available at the six-year-old facility.

The building itself is of modern design and was constructed using stucco, an inexpensive option in comparison to brick. Because of the area's freeze/thaw weather pattern, project architects wanted to make sure that a coating system with elastomeric properties was used to protect the library's exterior surface. Tnemec coating consultant Tiffany Goulet recommended a coating system that would perform perfectly on the library.

Following surface preparation in accordance with SSPC-SP13/NACE No. 6 Surface Preparation of Concrete, Series 151-1051 Elasto-Grip FC, a flexible waterborne epoxy, was brush- and roller-applied as a primer to the exterior surface. Two coats of Series 156 Enviro-Crete, a premium acrylate coating that can bridge minor hairline cracks in concrete and masonry substrates, was then brush- and roller-applied to the surface. Series 156 is a widely used durable coating for exterior masonry substrates due to its excellent ability to withstand thermal cycling.

"Series 156 was the perfect coating for this project with its moisture intrusion resistance and breathability characteristics," said Goulet. "The library turned out nicely for the residents of Lavergne."

Project Name City of Lavergne Library	**Project Completion Date** August 2002	**Architect** EOA, Nashville, TN
Project Location Lavergne, TN	**Owner** City of Lavergne	**Field Applicator** Commercial Painting, Nashville, TN

Trifab® VG (VersaGlaze®)

Trifab® VG 450, 451 & 451T (Thermal) Framing Systems & Trifab® 451UT (Ultra Thermal) Framing System

Design + Performance
Versatility with Unmatched
Fabrication Flexibility

Preston Pointe, Louisville, KY
Architect: Potter & Associates Architects PLLC, Louisville, KY
Glazing Contractor: Kentucky Mirror & Plate Glass Company, Louisville, KY

Trifab® VG (VersaGlaze®) is built on the proven and successful Trifab® platform – with all the versatility its name implies. There are enough framing system choices, fabrication methods, design options and performance levels to please the most discerning building owner, architect and installer. The Trifab® VG family's newest addition, Trifab® 451UT (Ultra Thermal) framing system, is designed for the most demanding thermal performance and employs a "dual" Isolock® Thermal Break.

Aesthetics

Trifab® VG framing systems offer designers a choice of front-, center-, back- or multi-plane glass applications. Structural silicone glazing (SSG) and Weatherseal glazing options further expand the designers' choices, allowing for a greater range of design possibilities for specific project requirements and architectural styles. All systems have a 4-1/2" frame depth – Trifab® VG 450 has 1-3/4" sightlines, while Trifab® VG 451/451T and Trifab® 451UT have 2" sightlines.

KAWNEER
AN ALCOA COMPANY

With seamless incorporation of Kawneer entrances or windows, including GLASSvent® visually frameless ventilators, Trifab® VG can be used on almost any project. These framing systems can also be packaged with Kawneer curtain walls and overhead glazing, thereby providing a full range of proven, and tested, quality products for the owner, architect and installer from a single source supplier.

Economy

Trifab® VG 450, 451 and 451T framing systems offer four fabrication choices to suit your project (Trifab® 451UT available as screw spline fabrication only):

- **Screw Spline** – for economical continuous runs utilizing two piece vertical members that provide the option to pre-assemble units with controlled shop labor costs and smaller field crews for handling and installation.
- **Shear Block** – for punched openings or continuous runs using tubular moldings with shear block clips that provide tight joints for transporting large pre-assembled multi-lite units.
- **Stick** – for fast, easy field fabrication. Field measurements and material cuts can be done when metal is on the job.
- **Type B** – Same fabrication benefits as shear block except head and sill run through.

All systems can be flush glazed from either the inside or outside. The Weatherseal option provides an alternative to SSG vertical mullions for Trifab® VG 450, 451 and 451T. This ABS/ASA rigid polymer extrusion allows complete inside glazing and creates a flush glass appearance on the building exterior without the added labor of scaffolding or swing stages. Additionally, High-Performance (HP) Flashing options are engineered to eliminate perimeter sill fasteners and associated blind seals.

Brighton Landing, Cambridge, MA
Architects: ADD Inc., Cambridge, MA
Glazing Contractors: Ipswich Bay Glass Company, Inc., Rowley, MA

Finishes

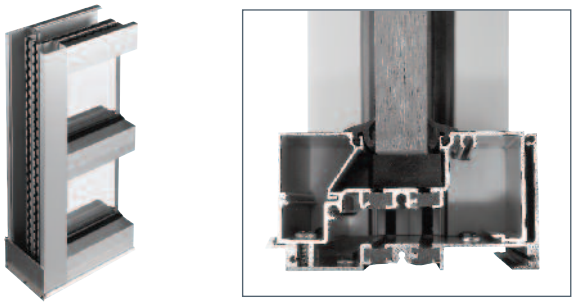
Architectural Class I anodized aluminum finishes are available in clear and Permanodic® color choices.

Painted finishes, including fluoropolymer that meet or exceed AAMA 2605, are offered in many standard choices and an unlimited number of specially-designed colors.

Solvent-free powder coatings add the "green" element with high performance, durability and scratch resistance that meet the standards of AAMA 2604.

Performance

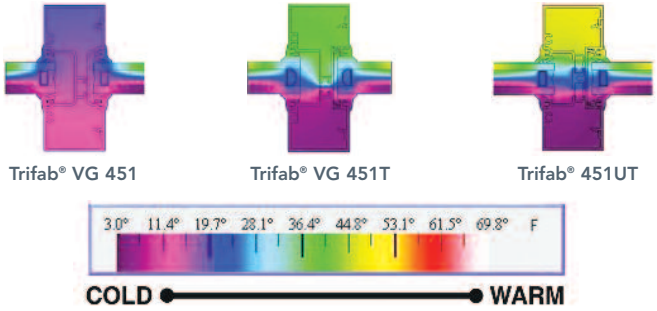
Kawneer's Isolock® Thermal Break process creates a composite section, prevents dry shrinkage and is available on Trifab® VG 451T. For even greater thermal performance, a "dual" Isolock® Thermal Break is used on Trifab® 451UT.



Trifab® 451UT uses a "dual" Isolock® Thermal Break (right) and features a new HP (High Performance) sill design, which incorporates a screw-applied end dam (left), ensuring positive engagement and tight joints between the sill flashing and end dam.

U-factor, CRF values and STC ratings for Trifab® VG vary depending upon the glass plane application. Project specific U-factors can be determined for each individual project. (See the Kawneer Architectural Manual or Kawneer.com for additional information).

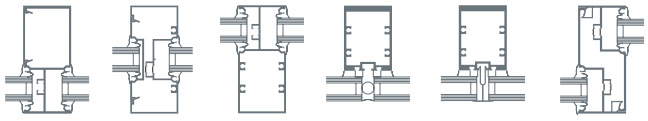
Thermal simulations showing temperature variations from exterior/cold side to interior/warm side.



Performance Test Standards

Air Performance	ASTM E 283
Water	AAMA 501 and ASTM E 331
Structural	ASTM E 330
Thermal	AAMA 1503
Thermal Break	AAMA 505 and AAMA TIR-A8
Acoustical	AAMA 1801 and ASTM E 1425

Trifab® VG 450, 451 and 451T glazing options
(note: Trifab® 451UT available as center set glass plane only).



Kawneer Company, Inc.
Technology Park / Atlanta
555 Guthridge Court
Norcross, GA 30092

kawneer.com
770 . 449 . 5555

KAWNEER
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SOLARBAN®60
SOLAR CONTROL LOW-E GLASS

PPG IdeaScapes™
Glass • Coatings • Paint

Solarban® 60 solar control, low-e glass by PPG was engineered to control solar heat gain, which is essential to minimizing cooling costs. In a standard one-inch insulating glass unit (IGU), ***Solarban*** 60 glass offers an exterior appearance similar to clear, uncoated glass.

With a very good Solar Heat Gain Coefficient (SHGC) of 0.38, ***Solarban*** 60 glass blocks 67 percent of the total solar energy while allowing 70 percent of the visible light to pass through. This combination produces an excellent Light to Solar Gain (LSG) ratio of 1.85, along with exceptional insulating performance, as evidenced by its 0.29 winter nighttime U-value.

Aesthetic Options

Solarban 60 glass can be coated on ***Starphire***® glass and paired with ***Starphire*** glass to produce an IGU with exceptional clarity and solar control characteristics. For even more color and performance options, it can be coated on the second (#2) surface of most ***Oceans of Color***® and Earth & Sky performance tints, or combined in an IGU with any PPG tinted glass, ***Solarcool***® reflective glass or ***Vistacool***™ subtly reflective, color-enhanced glass (see performance data on back page).

Solarban 60 Glass and Sustainable Design

An energy modeling study conducted by an independent energy design and consulting firm showed that architects and building owners can potentially save millions of dollars during a building's lifetime by specifying ***Solarban*** 60 glass instead of less advanced architectural glazings.

For instance, the study showed that, by substituting ***Solarban*** 60 glass in place of dual-pane tinted glass, the owners of a typical glass-walled, eight-story office building in Boston could lower their initial HVAC equipment costs by nearly $350,000 while realizing annual energy savings of more than $80,000. Corresponding carbon emissions from the same building were also reduced by more than 300 tons per year, which eclipses the total carbon emissions generated by 31,000 gallons of gasoline.

In addition to making products that support sustainable design, PPG has pioneered innovative technologies that reduce energy consumption during the glass-making process. PPG promotes environmentally responsible manufacturing by recovering and reusing virtually all of its glass manufacturing byproducts and by shipping its materials on reusable steel racks. PPG also facilitates regional sourcing through its nationwide network of certified glass fabricators and laminators.

Prudential Center
Location: *Newark, NJ*
Product: Solarban *60 Glass*
Architect: *Morris Adjmi Architects*
Glass Contractor: *Josloff Glass*
Glass Fabricator: *J.E. Berkowitz, LP*

Streeter Place
Location: *Chicago, IL*
Product: Solarban *60 Glass*
Architect: *Solomon Cordwell Buenz and Associates*
Owner/Developer: *Golub and Company*
Glass Fabricator: *Northwestern Industries, Inc.*
Glazing Contractor: *Custom Windows and J&D Erectors*

With ***Solarban*** 60 glass, sustainable design and LEED credit opportunities are provided according to the following criteria:

LEED / Green Design Category	Feature	Benefit
Optimizing Energy Performance	Excellent SHGC, U-value, and Tvis performance	Enhance energy performance of building design
Daylight & Views	High visible light transmittance	Connectivity to natural lighting and the outdoors
Innovation in Design	MBDC Cradle to Cradle Certification	Selection of environmentally-focused product evaluation

SOLARBAN®60
SOLAR CONTROL LOW-E GLASS

Fabrication and Availability

Solarban 60 glass can be heat-strengthened, tempered and laminated, and is readily available as a standard product. Like other high-performance PPG architectural glasses, ***Solarban*** 60 glass is available through more than 65 locations of the ***PPG Certified Fabricator® Network***. PPG Certified Fabricators can meet tight construction deadlines and accelerate the delivery of replacement glass before, during and after construction.

PPG Certified Fabricator® Network

Additional Resources

Solarban 60 glass is just one of many ***Ecological Solutions from PPG***™. For more information, or to obtain samples of this product, call 888-PPG-IDEA (774-4332), or visit www.ppgideascapes.com.

ecological Solutions from PPG™

All PPG architectural glass is ***Cradle to Cradle® Certified***.

PPG *IdeaScapes*™ Integrated products, people and services to inspire your design and color vision.

Solarban® 60 Glass Performance — Commercial Insulating Glass Unit Comparisons Using 1/4" (6mm) Glass

Insulating Vision Unit Performance Comparisons 1-inch (25mm) units with 1/2-inch (13mm) airspace and two 1/4-inch (6mm) lites; as shown below

Glass Type	Transmittance			Reflectance		U-Value (Imperial)		European U-Value	Shading Coefficient	Solar Heat Gain Coefficient	Light to Solar Gain (LSG)
	Ultra-violet %	Visible %	Total Solar Energy %	Visible Light %	Total Solar Energy %	Winter Night-time	Summer Day-time				
***SOLARBAN*® 60 Solar Control Low-E Glass**											
SOLARBAN 60 (2) *STARPHIRE**	25	74	38	11	43	0.29	0.27	1.55	0.46	0.40	1.85
SOLARBAN 60 (2) Clear + Clear	19	70	33	11	29	0.29	0.27	1.55	0.44	0.38	1.85
SOLEXIA™ + *SOLARBAN* 60 (3) Clear	10	61	25	11	11	0.29	0.27	1.55	0.42	0.36	1.70
ATLANTICA™ + *SOLARBAN* 60 (3) Clear	5	53	20	9	7	0.29	0.27	1.55	0.35	0.30	1.78
CARIBIA® + *SOLARBAN* 60 (3) Clear	8	54	20	9	7	0.29	0.27	1.55	0.35	0.31	1.74
AZURIA™ + *SOLARBAN* 60 (3) Clear	13	54	21	9	7	0.29	0.27	1.55	0.36	0.31	1.75
PACIFICA™ + *SOLARBAN* 60 (3) Clear	5	34	15	6	7	0.29	0.27	1.55	0.29	0.25	1.36
SOLARBLUE™ + *SOLARBAN* 60 (3) Clear	10	45	21	8	13	0.29	0.27	1.55	0.37	0.32	1.39
SOLARBRONZE® + *SOLARBAN* 60 (3) Clear	8	42	20	7	17	0.29	0.27	1.55	0.36	0.31	1.36
SOLARGRAY® + *SOLARBAN* 60 (3) Clear	8	35	17	7	13	0.29	0.27	1.55	0.32	0.28	1.26
GRAYLITE® II + *SOLARBAN* 60 (3) Clear	1	7	4	4	5	0.29	0.27	1.55	0.14	0.12	0.58
SOLARBAN 60 (2) *SOLEXIA* + Clear	10	61	25	10	11	0.29	0.27	1.55	0.36	0.32	1.92
SOLARBAN 60 (2) *ATLANTICA* + Clear	5	54	20	8	7	0.29	0.27	1.55	0.31	0.27	1.98
SOLARBAN 60 (2) *AZURIA* + Clear	13	54	21	8	7	0.29	0.27	1.55	0.32	0.28	1.93
SOLARBAN 60 (2) *PACIFICA* + Clear	5	34	15	6	7	0.29	0.27	1.55	0.26	0.22	1.52
SOLARBAN 60 (2) *SOLARBLUE* + Clear	10	45	21	7	13	0.29	0.27	1.55	0.32	0.28	1.60
SOLARBAN 60 (2) *SOLARBRONZE* + Clear	8	42	20	7	16	0.29	0.27	1.55	0.31	0.27	1.56
SOLARBAN 60 (2) *SOLARGRAY* + Clear	8	35	17	6	12	0.29	0.27	1.55	0.28	0.24	1.47
***VISTACOOL*™ Glass with *SOLARBAN*® 60 Solar Control Low-E (3)**											
VISTACOOL (2) *AZURIA* + Low-E	11	42	16	20	11	0.29	0.27	1.55	0.30	0.26	1.61
VISTACOOL (2) *PACIFICA* + Low-E	4	26	12	11	9	0.29	0.27	1.55	0.24	0.21	1.23
VISTACOOL (2) *SOLARGRAY* + Low-E	7	27	14	11	15	0.29	0.27	1.55	0.28	0.24	1.13
***SOLARCOOL*® Glass (Reflective) with *SOLARBAN*® 60 Solar Control Low-E (3)**											
SOLARCOOL (2) *SOLEXIA* + Low-E	3	24	10	24	15	0.29	0.27	1.55	0.22	0.19	1.26
SOLARCOOL (2) *AZURIA* + Low-E	4	21	8	19	10	0.29	0.27	1.55	0.19	0.16	1.31
SOLARCOOL (2) *PACIFICA* + Low-E	2	13	6	10	8	0.29	0.27	1.55	0.17	0.15	0.89
SOLARCOOL (2) *SOLARBLUE* + Low-E	3	17	9	14	15	0.29	0.27	1.55	0.21	0.18	0.97
SOLARCOOL (2) *SOLARBRONZE* + Low-E	3	17	9	14	18	0.29	0.27	1.55	0.21	0.18	0.92
SOLARCOOL (2) *SOLARGRAY* + Low-E	2	14	7	11	14	0.29	0.27	1.55	0.19	0.16	0.86
SOLARCOOL (2) *GRAYLITE* II + Low-E	<1	3	2	5	5	0.29	0.27	1.55	0.12	0.10	0.28

* Data based on using *Starphire* glass for both interior and exterior lites.

All performance data calculated using LBNL Window 5.2 software, except European U-value, which is calculated using WinDat version 3.0.1 software. For detailed information on the methodologies used to calculate the aesthetic and performance values in this table, please visit www.ppgideascapes.com or request our Architectural Glass Catalog.

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CERTIFIED cradle to cradle SILVER

PPG IdeaScapes™ Glass • Coatings • Paint

Mapes-R™

Insulated Composite Panels

THE "GREEN" SOLUTION FOR GLAZING APPLICATIONS

With insulation values up to R=27.9, Mapes-R panels offer a wide variety of solutions to improve the thermal efficiency of window, spandrel, curtain wall and glazing applications. Mapes-R panels can be manufactured to match any architectural finish including Kynar, anodized, porcelain, and baked enamel. In addition to thermal improvement, Mapes-R panels can meet local building codes for sound, fire and impact resistance.

BENEFITS

- High Thermal Values—R up to 27.9
- Increased Energy Efficiency
- Lower Heating/Cooling Costs
- More Design Options (vs. Glass)
  - Impact Resistant
  - Fire Resistant
  - Graffiti Proof
- Custom Colors
- 25 Year Lamination Warranty
- LEED Credit

APPLICATIONS

- Insulated Spandrel Glass
- Curtain Wall
- Window Replacement
- Transoms
- Door Sidelights
- Metal Spandrel Panels
- Passive Solar Control

For design and budget information, please visit www.mapes.com/panels/infill

mapes
ARCHITECTURAL PANELS

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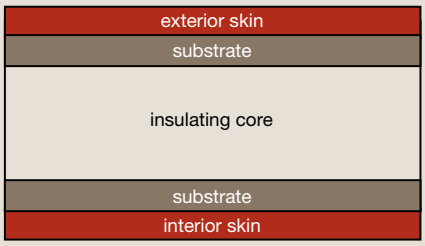
2929 Cornhusker Hwy / Lincoln, NE 68504
800-228-2391 / 800-737-6756 fax
panels@mapes.com / www.mapes.com

Mapes-R™
Insulated Composite Panels

TYPICAL CROSS SECTION



LEED CONTRIBUTIONS

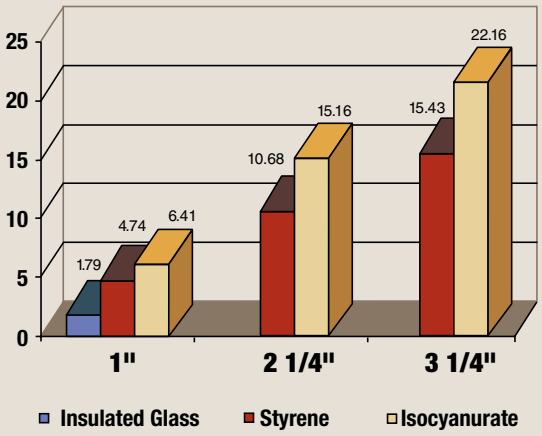
Energy & Atmosphere
1-10 points-Two {2} points mandatory

EA Credit 1.1 Optimize Energy Performance
Achieving increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

Indoor Environmental Quality
One {1} Point

EQ Credit Thermal Comfort, Design
Provide for a comfortable thermal environment that supports the productivity and well-being of the building occupants

MAPES PANELS VS. INSULATED GLASS

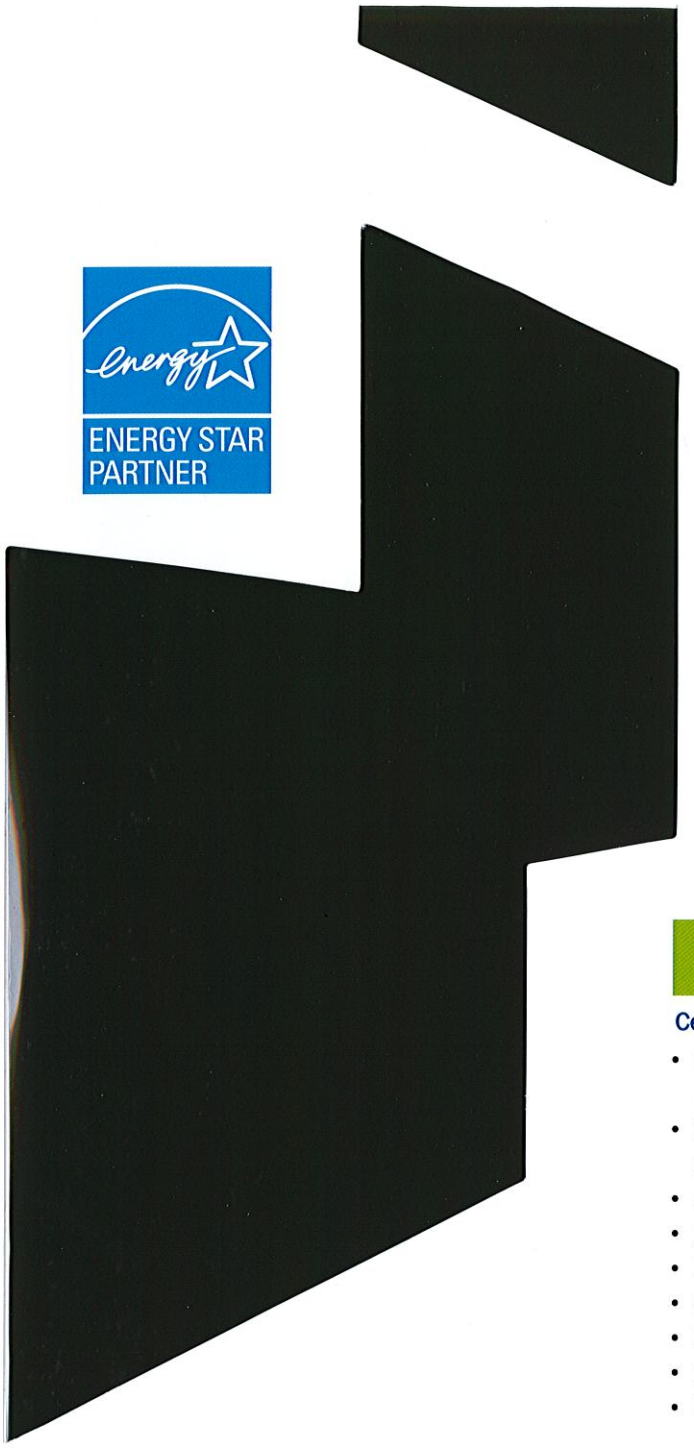


SELECTION GUIDE

SKINS	THICKNESS	TEXTURE *EMBOSSED*	TEXTURE *SMOOTH*	STANDARD COLORS	CUSTOM COLORS	AVAILABLE WIDTHS 48"	AVAILABLE WIDTHS 60"	FINISH WARRANTY
Porcelain on Aluminum	0.016	•		24	•	•	•	25
Porcelain on Steel	0.014		•	8	•	•	•	20
Standard .032 Kynar	0.032	•	•	18		•		20
Custom Kynar	0.036 - 0.125	•	•		•	•	•	10
Spandrel Glass	0.25		•	8	•	•	•	5
Colorlume E	0.012	•		6		•	•	5
Colorlume S	0.022		•	2		•	•	5
.025 Clear Anodized (Coil)	0.025		•	1		•		N/A
.025 Bronze Anodized (Coil)	0.025		•	1		•		N/A
Class 1 Anodized	0.036 - 0.125	•	•		•	•	•	

SUBSTRATES					LAMINATION WARRANTY
1/8" Hardboard	0.125	MOST ECONOMICAL	•	•	25
3/16" Hardboard	0.187	MOST ECONOMICAL	•	•	25
1/2" Gypsum	0.5	FIRE RESISTANT	•		25
Cement Board	4mm	WATER/IMPACT RESISTANT	•		25
Corelite (H.D.P.E.)	4mm	WATER RESISTANT	•	•	5

CORES	
2# Density Polystyrene	most cost effective per R-Value *(4.74 - 20.31 R-Value)*
Isocyanurate	most insulation per inch *(6.41 - 27.79 R-Value)*
Micore	Class A Fire Rated *(3.05 - 15.50 R-Value)*



HÜPER OPTIK®

Nano-Ceramic Window Films

ENERGY STAR PARTNER

Why Nano-Ceramic Films?

- World's first patented nano-ceramic technology
- Superb durability - resistance to seashore (high-salt) environment
- High total solar energy rejection
- High ultraviolet rejection - greater than 99.9%
- 100% dye-free and 100% metal-free
- Natural tone with low reflectivity
- Scratch-resistant hardcoat

HÜPER CERAMIC 30

Ceramic 30 Benefits:

- Residential limited lifetime and commercial fifteen-year limited product warranty
- Cutting-edge technology with remarkable heat rejection performance
- Avoids demetallization or discoloration
- Increases comfort - cooler interior
- Reduces glare and fading of interior upholstery
- Saves energy by reducing fuel/electricity consumption
- Protects against sun-related skin problems - SPF>200
- Enhances safety with improved glass shatter resistance
- Enhances overall aesthetics with a soft natural shade

X3

Meister Keramische Technologie

HÜPER OPTIK®
Nano-Ceramic Window Films

The Smarter Choice:
Nano-Ceramic Films

X3 TiN TITANIUM NITRIDE Advanced Ceramic 1•3•4•13•25

Powered by Meister Keramische Technologie

HÜPER CERAMIC 30

Specifications	Single Pane	Double Pane
Visible Light Transmission	30%	29%
Visible Light Reflectance	11%	12%
Shading Coefficient	0.43	0.56
Solar Heat Gain Coefficient	0.37	0.49
Infrared Rejection	86%	86%
UV Light Rejection	99.9%	99.9%
Total Solar Energy Rejected	63%	51%
Glare Reduction	62%	64%
U-value	1.04	0.47

www.huperoptikusa.com

Performance data is based on this film being applied to the inside of 3mm clear glass. All data calculated using the definitions and equations in ISO9050 & ASHARE Handbook. The data is subject to variations within industry standards.

phone: 888.296.3456 & fax: 832.467.1190

X3 Meister Keramische Technologie

HSPE-C30

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Washington, DC

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TNEMEC EXTERIOR AGGREGATE PANELS & COLUMNS COATING PROJECTS

Tnemec

Series 156 Enviorcrete

1100 L Street NW

Washington, DC

17th & L Street, NW

Washington, DC

1600 Wall System®1 / System®2

Imposing Statements – Used Together Or Independently

Knight Oil Tools Corporate Facility, Lafayette, LA
Architect: Donald J. Breaux Architect, Lafayette, LA
Glazing Contractor: Advantage Glass & Mirror, New Iberia, LA, with installation assistance from DeGeorge Glass Company, Inc., Metairie, LA

Building on the proven success of Kawneer's 1600 Wall System® which set the standards for curtain wall engineering, 1600 Wall System®1 and 1600 Wall System®2 provide reliability with versatile features. Both are stick-fabricated, pressure glazed curtain walls for low-to-mid-rise applications and are designed to be used independently or as an integrated system to provide visual impact for almost any type of building.

- 1600 Wall System®1 is an outside glazed, captured curtain wall
- 1600 Wall System®2 is a Structural Silicone Glazed (SSG) curtain wall

Aesthetics

Even the smallest details of 1600 System®1/1600 Wall System®2 reflect the aesthetics and reliability that derive from Kawneer's precise engineering and experience. The joinery for both systems is accomplished with concealed fasteners to create unbroken lines and a monolithic appearance. When using optional, open back horizontal mullions, the fillers snap at the edge, producing an uninterrupted sight line.

KAWNEER
AN ALCOA COMPANY

Performance

Key aspects of 1600 System®1 and 1600 Wall System®2 are enhanced for higher performance. Pressure equalization has been designed into the system and all components are silicone compatible to provide superior longevity. For installations where severe weather conditions are prevalent, 1600 Wall System®1 has been large missile hurricane impact and cycle tested. Proven through years of high performance, both systems are tested according to industry standards:

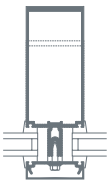
Air Performance	ASTM E-283
Static Water Penetration	ASTM E-331
Dynamic Water Penetration	AAMA 501.1
Structural Performance	ASTM E-330
"U" Value, CRF	AAMA 1503.1
Sound Transmission Rating	ASTM E 90-90
Seismic Performance	AAMA 501.4

For the Finishing Touch

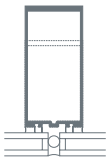
Permadonic Anodized finishes are available in Class I and Class II in seven different colors.

Painted Finishes, including fluoropolymer that meet or exceed AAMA 2605, are offered in many standard choices and an unlimited number of specially-designed colors.

Solvent-free powder coatings add the "green" element with high performance, durability and scratch resistance that meet the standards of AAMA 2604.



1600 Wall System®1



1600 Wall System®2

1600 Wall System®1/1600 Wall System®2:

- for reliability
- for performance
- for versatility
- for a smooth, monolithic appearance
- for uninterrupted sight lines

Hunter Henry Center at Mississippi State University,
Mississippi State, MS
Architect: Foil Wyatt Architects & Planners, P.A., Jackson, MS
Glazing Contractor: American Glass Company, Inc., Columbus, MS

Kawneer Company, Inc.
Technology Park / Atlanta
555 Guthridge Court
Norcross, GA 30092

kawneer.com
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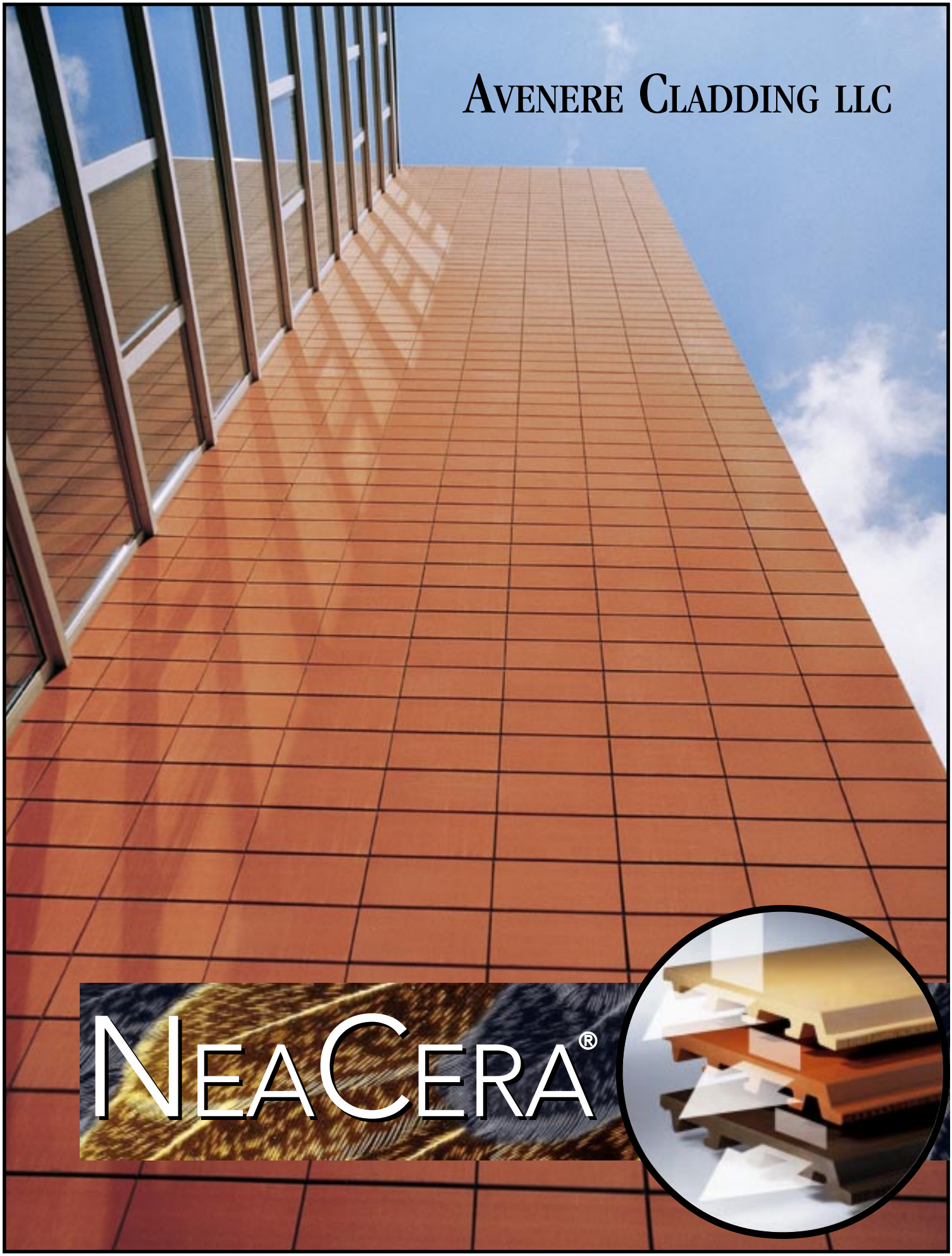
Avenere Cladding LLC



NeaCera®

The Industry's Premium & Affordable

Terra-cotta Rainscreen Solution!

PRODUCT OVERVIEW

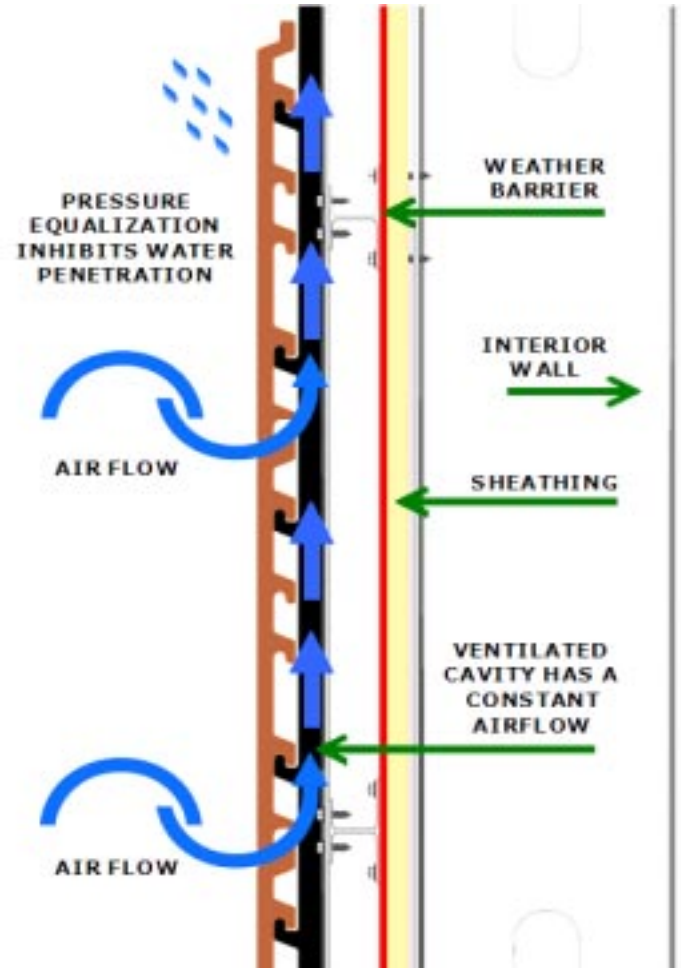
Avenere Cladding LLC specializes in NeaCera® Terra-cotta rainscreen panels and Vizor™ sunscreens throughout the United States. All of our products feature an industry-leading warranty and are the ideal building solutions for Architects, Builders and Installers alike.

NeaCera® is a complete, pre-engineered architectural back-ventilated rainscreen solution. Featuring Lift & Lock technology, NeaCera® panels weigh less than 7.5 lbs. per square foot. Their innovation comes from a solid, high-strength design with rear reinforcing ribs that also serve as a simple and fully integrated panel hanging mechanism. As a result, panels are quickly and easily installed onto aluminum Support Profiles with Joint Inserts, assuring consistent and uniform vertical and horizontal alignment. This substantial weight reduction as compared to competing Terra-cotta systems weighing 12-15 lbs. results in a considerable savings when designing and building with NeaCera®.

Durable as well as beautiful, NeaCera® Terra-cotta panels arrive at your job site ready to install.

RAINSCREEN PRINCIPLE

NeaCera® is based on the scientifically proven rainscreen principle. Simply stated, rainscreen (or back-ventilated) wall solutions can best be described as “breathing” or “living” walls. A ventilated cavity allows any rain water or condensation that penetrates beyond the wall panels to drain or quickly evaporate due to the constant flow of air. The second line of defense is a watertight weather-barrier that seals the interior of the building. Together they form a robust cladding solution that is unparalleled at preventing water penetration into the interior wall.



NeaCera®

Terra-cotta Rainscreen Solutions You Can Finally Afford...

MATT FINISHES

NeaCera® panels are offered in 9 **Matt Finishes** that are classic and distinctive.

Features LIFETIME GRAFFITI PROTECTION!


Brick Red 2032


Brick Red 2066


Toscana


Beige

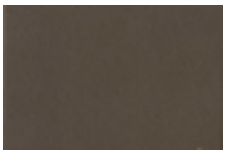

Pearl Gray


Flint Gray


Umbra Gray

Cream Light

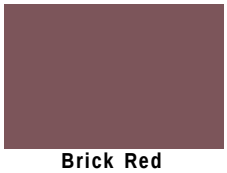
White Matt


Mocha

SATIN FINISHES

Where a more polished or honed look is preferred, NeaCera® panels are available in 12 **Satin Finishes**.

Features LIFETIME GRAFFITI PROTECTION!


Brick Red


Dark Red


Copper Red


Bright Red


Light Gray


Bright Gray


Middle Gray


Dark Gray


Cream


Sand


Eggshell

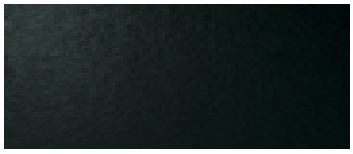

Anthracite

GLOSS FINISHES

For a sleek and modern look, consider NeaCera® panels in **Gloss Finishes**.

Features LIFETIME GRAFFITI PROTECTION!

White Glossy


Black Glossy

STONE FINISHES

Stone Finishes result from a powder coating process applied to Matt or Satin colors prior to firing. Up to 4 different color pigments can be applied in varying depths and patterns.

Features LIFETIME GRAFFITI PROTECTION!


Anthracite - Stone


White - Stone


Beige - Stone


Red - Stone

LIFETIME GRAFFITI PROTECTION

NeaCera® Terra-cotta Panels include Lifetime Graffiti Protection that is efficient, long-lasting and immediately effective.

This protection results from the fine milling and grinding of raw clay to a homogenous particle size during the NeaCera® production process, and the application of the engobe prior to firing in the kiln. This protection comes from the smooth finish attained during the extrusion process, coupled with the application of the engobe.

GLAZED & CUSTOM FINISHES

NeaCera® panels come in an unlimited spectrum of **Glazed and Custom Finishes**. Corporate colors also available.

Features LIFETIME GRAFFITI PROTECTION!

Blue 1 | Blue 2 | Blue 3 | Blue 4

Violet 1 | Violet 2 | Violet 3

Brown 1 | Brown 2

Note: Color representations on this page can vary from the real color. NeaCera panels are natural clay products and therefore are not perfectly consistant. Some colors and aggregate variations may exist.

Green 1 | Green 2 | Green 3 | Green 4

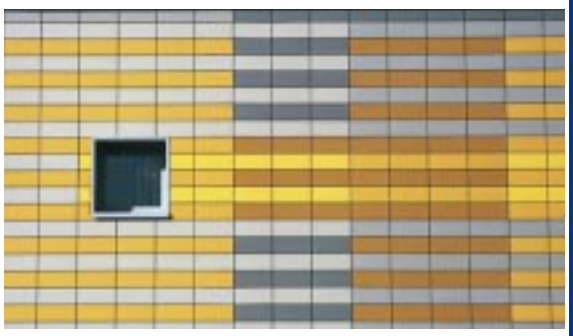
Turquoise 1 | Turquoise 2 | Turquoise 3

Golden 1 | Golden 2

Ochre 1 | Ochre 2

Coral 1 | Coral 2 | Coral 3

Orange 1 | Orange 2



Rose 1 | Rose 2

NeaCera®

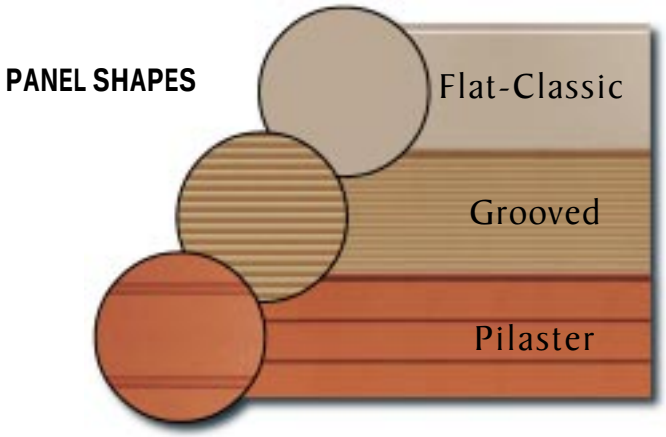
Note: Color representations on this page can vary from the real color. NeaCera panels are natural clay products and therefore are not perfectly consistant. Some colors and aggregate variations may exist.

NEACERA®

PANEL TECHNOLOGY

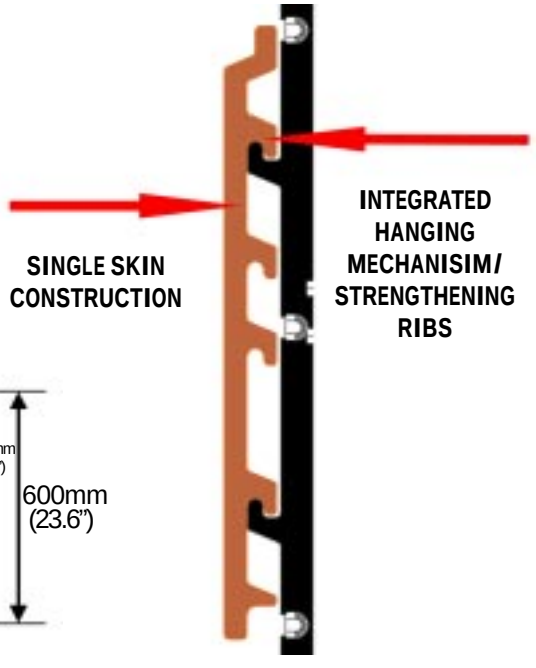
NeaCera® Terra-cotta panels embody the very best in terms of raw materials, manufacturing technology and innovative design. To begin with, only the highest-grade virgin clays, which is paramount to producing a robust/impact-resistant finished material.

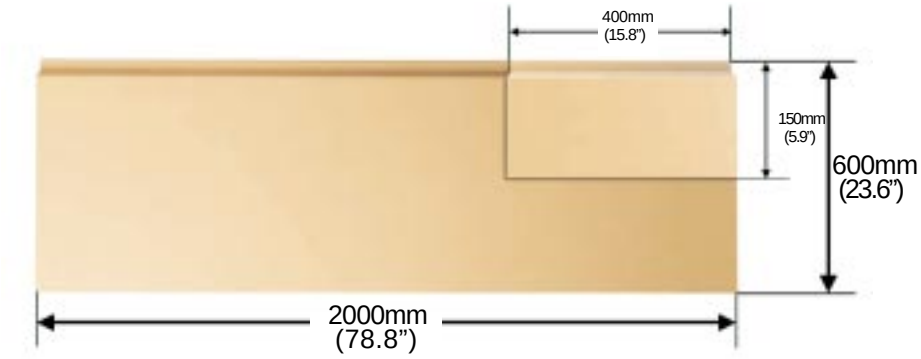
Next, the materials are processed with proprietary manufacturing techniques that maximize the performance characteristics of terra cotta. Notably, the patented Keralis® Baking Procedure (max temperature of 2200ºF) utilizes a multi-stage firing and annealing process to bolster the material's microcrystalline structure. The result is an ultra-hard material that is free of inclusions and has superior color-fastness and impact/chip-resistance.



Also integral to NeaCera's overall panel tensile strength and durability is its geometic shape. Using advanced Finite Element Analysis (FEA), our team of engineers developed the optimal shape to maximize panel strength while minimizing panel weight. The result of which is a solid, full-bodied, high-strength design with rear reinforcing ribs that also serve as a simple and fully integrated panel hanging mechanism. Less weight translates into huge savings during installation and for wall subconstruction, structural and foundation systems.

- High Impact Resistance
- Lightweight Construction
- Color Fastness
- Strengthening Ribs
- Integrated Hanging Mechanism

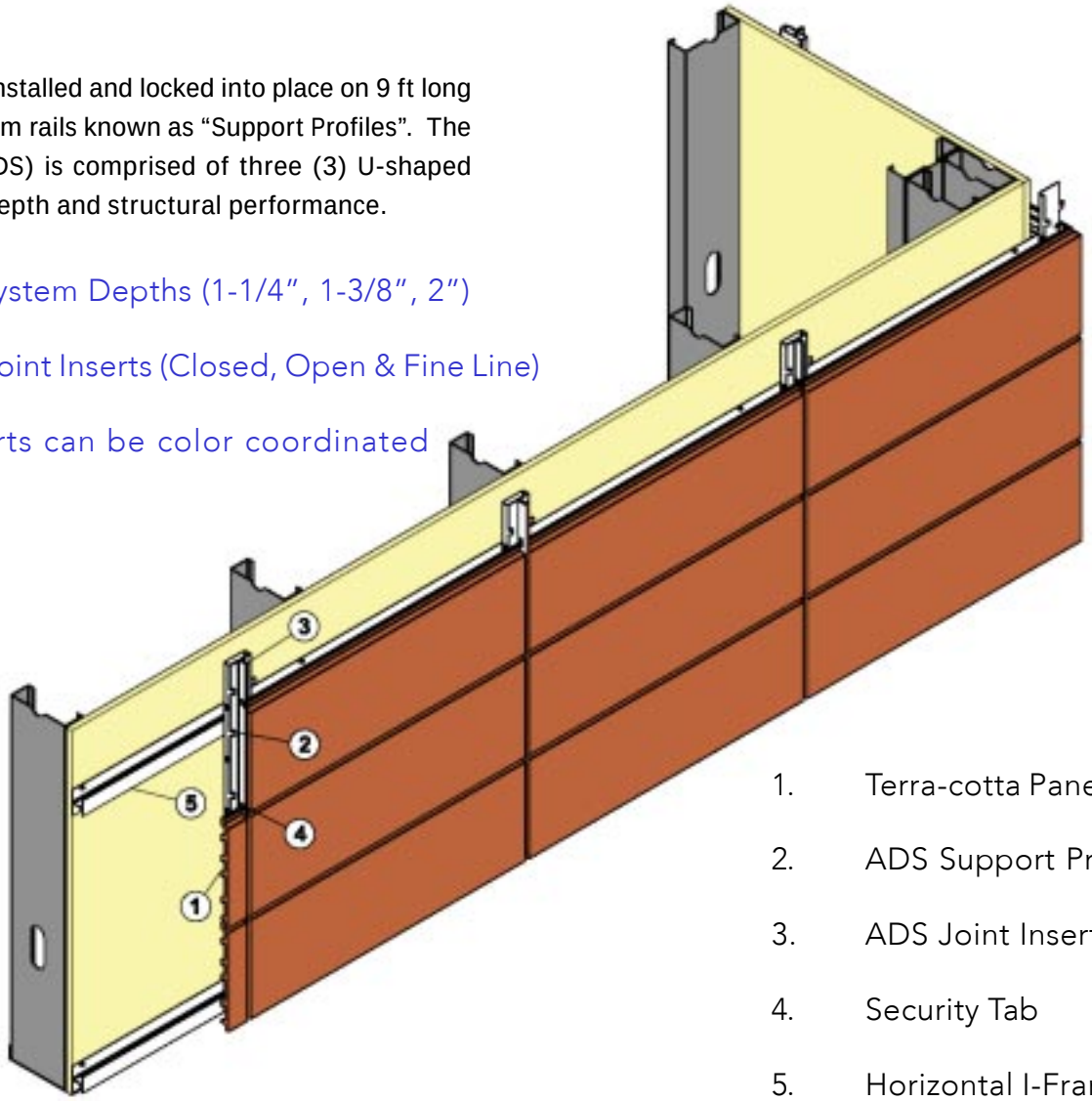




SUPPORT PROFILES
(ADS SYSTEM)

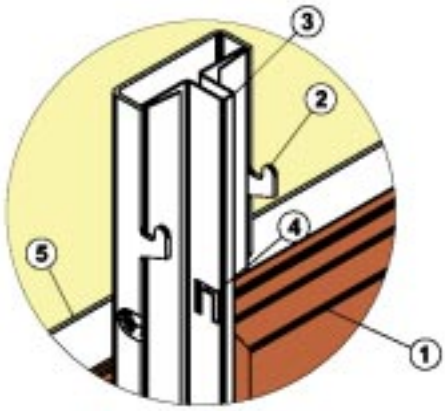
NeaCera panels are installed and locked into place on 9 ft long x 2.5 in wide aluminum rails known as “Support Profiles”. The Adaptive System (ADS) is comprised of three (3) U-shaped frames that vary in depth and structural performance.

- Multiple System Depths (1-1/4”, 1-3/8”, 2”)
- Different Joint Inserts (Closed, Open & Fine Line)
- Joint Inserts can be color coordinated

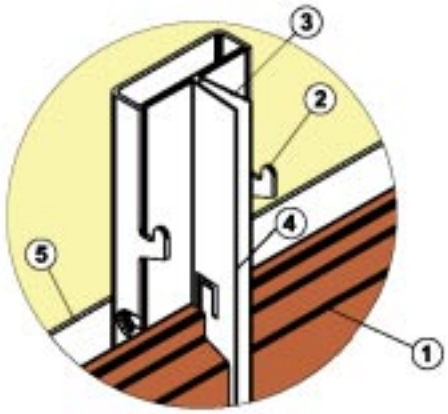


1. Terra-cotta Panel
2. ADS Support Profile
3. ADS Joint Insert
4. Security Tab
5. Horizontal I-Frame™

Closed Joint Insert

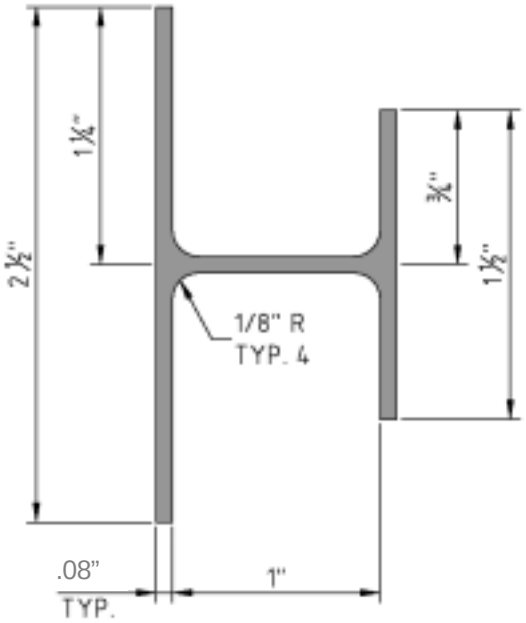


Open Joint Insert



SUB-CONSTRUCTION

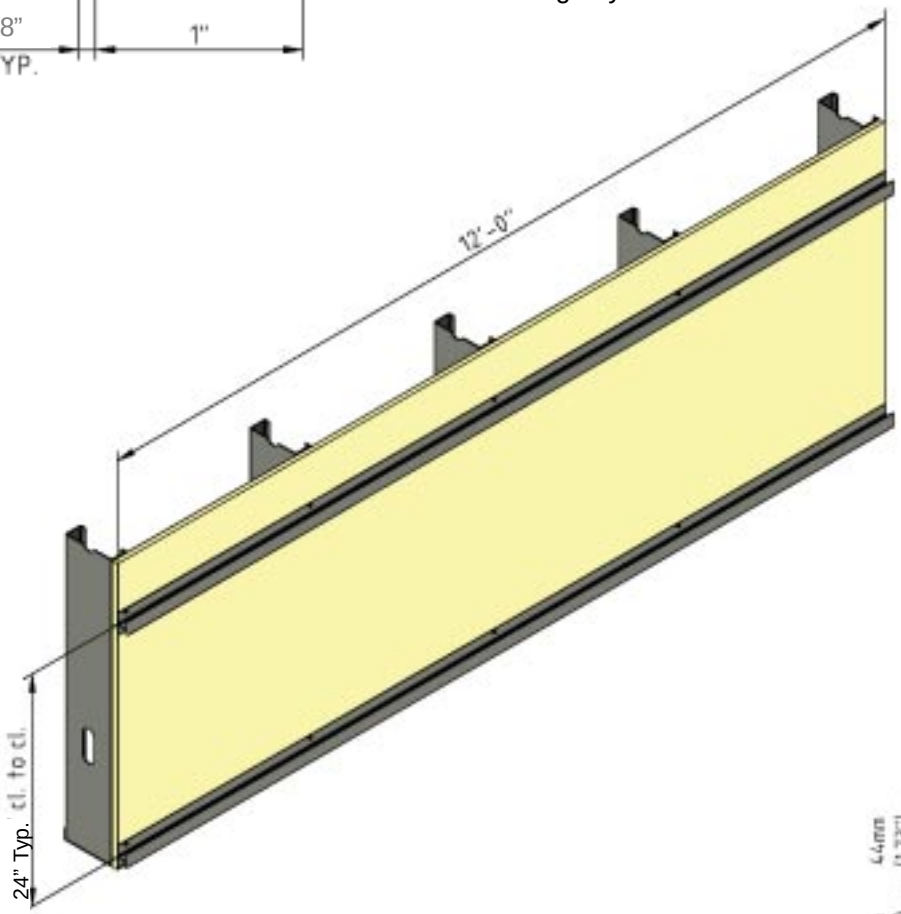
I-FRAME™



The sub-construction of the NeaCera rainscreen system has been intelligently designed with ease of installation in mind and the flexibility to accommodate any external insulation size. Unlike other systems that require a litany of cumbersome parts, our engineers have developed a single structural component known as the I-Frame.

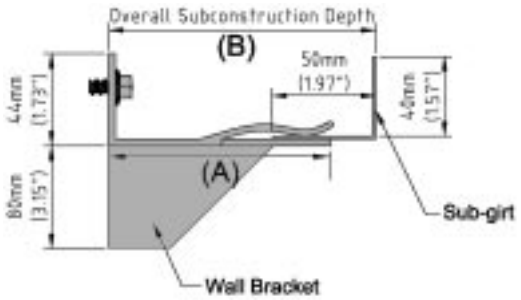
The I-Frame is a lightweight, yet durable, 6061-T6 aluminum extrusion with superior corrosion resistant properties. It is manufactured in 12 foot sections, weighing approximately 6 lbs each, and can be easily trimmed in the field to adapt to any building dimension. Moreover, its enhanced I-Shaped design gives tool access to both the front flange and the rear flange for an effortless installation process.

Each I-Frame is nominally spaced 27 inches apart and attached directly to the vertical studs of the building. In turn, the vertical panel supports are fastened to the resultant network of I-Frames for optimal strength and rigidity.



- Lightweight
- Durable
- Corrosion Resistant
- Versatile
- Easy to Install

ADS BRACKET



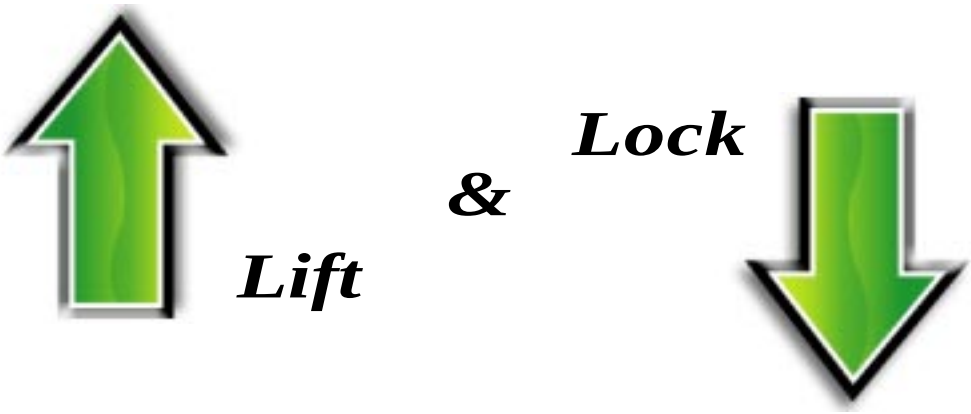
Lift & Lock
INSTALLATION

NeaCera®

NeaCera is simple and easy to install. With our patented *Lift & Lock* System, NeaCera panels are literally "Out of the box and Onto the wall".

Virtually all other terra-cotta based wall systems require multiple clips and supporting components throughout the installation process. The engineers at Avenere Cladding LLC have integrated the panel support mechanism directly into the back of the panel itself. As a result, installing NeaCera panels is as easy as Lifting and Locking them into place.

- "Out of the box and Onto the wall"
- No Clips, Hangers or external support
- Panels are securely locked in place

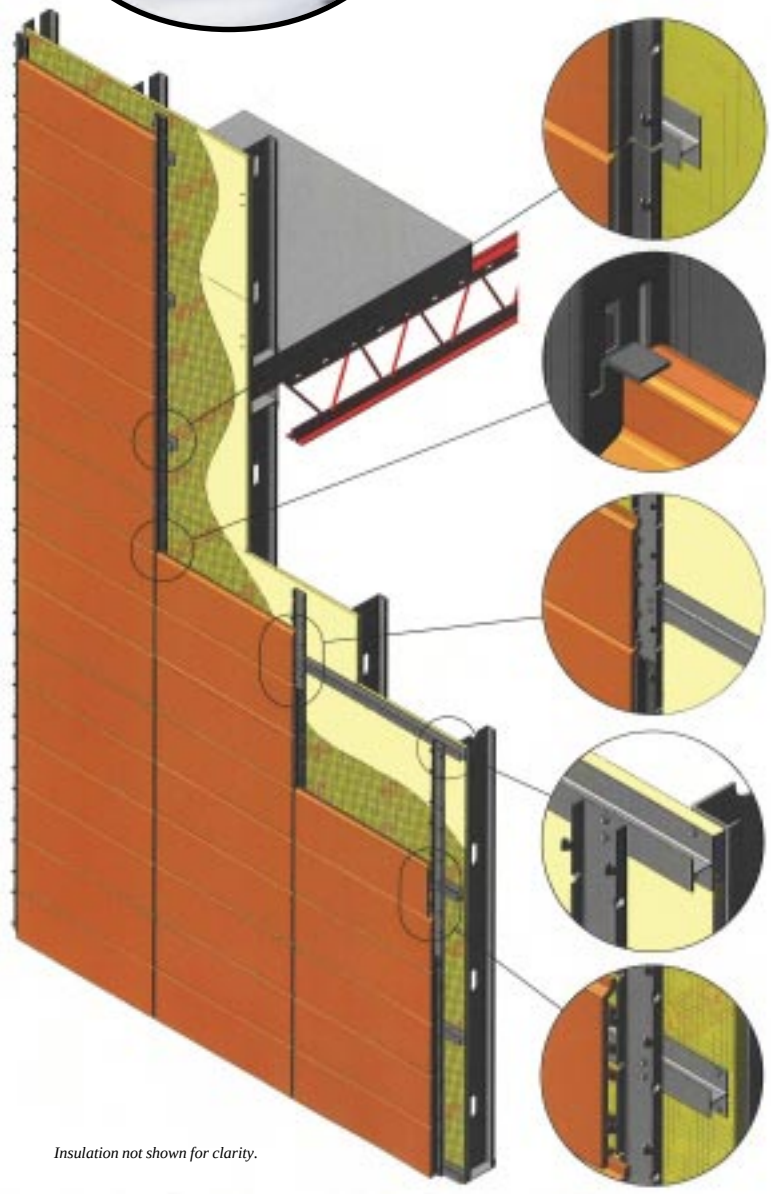


NEACERA®

SYSTEM OVERVIEW

NeaCera® is the latest innovation in terra-cotta panel technology. Our panels and Vizors™ are derived from the finest raw materials and produced by a propriety technology that has been developed and perfected over several decades to optimize product strength and durability. Moreover, our intelligently designed Support Profiles and Horizontal Sub-construction set the standard in terms of ease of installation and system flexibility. At 7.5 PSF, almost half of the weight of comparable systems, NeaCera boasts the distinction of being the "best in class" for system design and performance.

NeaCera has a full array of panel colors, sizes, surfaces and shapes. With natural, premium and an unlimited spectrum of custom colors, a designer's imagination is truly his/her only limitation. Panel sizes range from 6 inches to 24 inches in height and anywhere from 16 inches to 78 inches in width. Please see our full range of terra-cotta Vizors in Lamella, Baguette and Quad shapes.



Insulation not shown for clarity.

Support Profiles:

Come in 9ft lengths and are available in 4 depths, oriented vertically, diagonally or horizontally (for ceilings). Includes 2 hooks that engage at each end of the panel ribs, no matter what the panel width.

Joint Inserts:

Snap into Support Profiles and provide panel alignment and a spring to prevent panel rattle. Security tabs are cut into every Joint Insert at the top of panels to prevent removal at ground levels. Provides a vertical channel to direct water away from the sub-construction.

Horizontal Panel Joints:

Panels overlap 3/8" to prevent water flow from the forces of gravity, momentum, surface tension and capillary action.

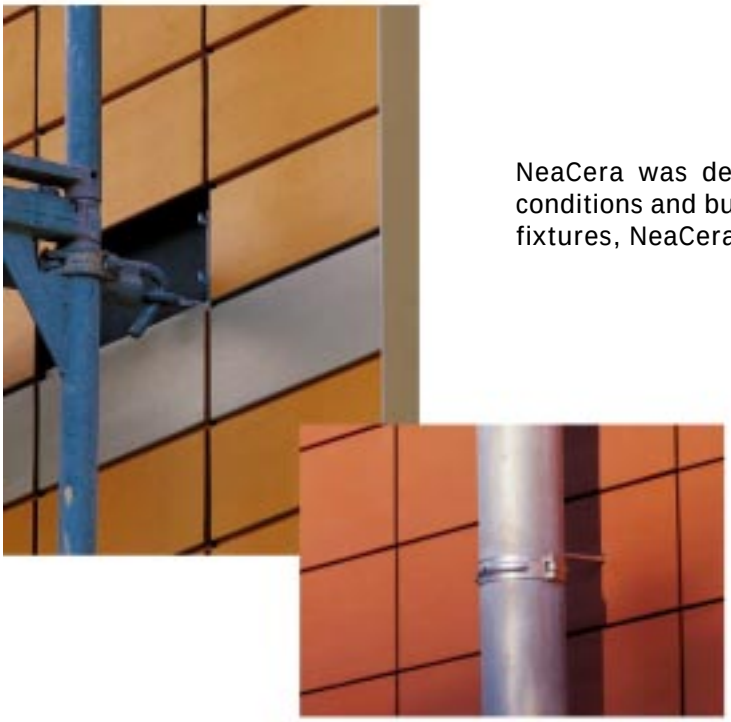
I-Frames™:

I-Frames are available in 1", 2", 2.5", and 3" depths, and are securely fastened to the vertical wall studs. They accomodate the random spacing of wall studs when attaching Support Profiles and support exterior insulation.

Weather Barrier:

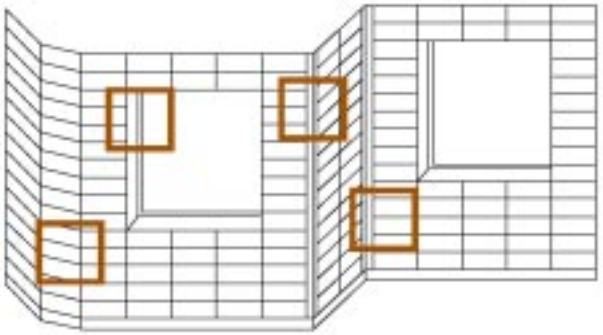
An air/water barrier is important to control penetration of water, air and vapor for the success of every rainscreen wall assembly.

DESIGN FLEXIBILITY



NeaCera was designed to accommodate a wide variety of facade conditions and building fixtures. From outside corners to soffits to light fixtures, NeaCera has an intuitive and seamless solution.

- Outside Corners / Inside Corners
- Doors / Windows
- Soffits
- Light Fixtures
- Door Overhangs
- Gable Ends



NEACERA®

TECHNICAL DATA

**Because of the numerous choices of panel sizes and sub-construction, please call 866.388.8833 for specifics for your application or visit our website www.avenerecladding.com

WARRANTY:	30-year limited warranty
PANEL HEIGHTS: **(Custom Sizes Available)**	150mm (5.9”), 175mm (6.9”), 200mm (7.9”), 225mm (8.9”), 250mm (9.8”), 300mm (11.8”), 400mm (15.7”), 500mm (19.7”), and 600mm (23.6”)-Also available: 204.3mm (8”), 304.8mm (12”), 328mm(12 15/16”), 315mm(12 3/8”)
PANEL WIDTHS:	From 400mm (15.8”) to 2000mm (78.8”)
PANEL THICKNESS:	22mm (.87”), 26mm (1.02”), 34mm (1.34”)
SYSTEM WEIGHT:	7.5 lb/sf (based on 26mm thick panel)
HORIZONTAL I-FRAME DIMENSIONS:	1.2”, 2.2” or 3.2” X 12’ Long
HORIZONTAL I-FRAME SPACING:	24” O.C.- Typical
VERTICAL SUPPORT PROFILES:	**TYPE** / Base (BAS) / Adaptive (ADS) — **OVERALL SYSTEM DEPTH** / Min. 27mm (1.06”) / Max. 264.5mm (10.4”)
VERTICAL PANEL SUPPORTS LENGTH:	2743.2mm (9’) Typical
JOINT WIDTH:	9mm (0.35”) Typical
PANEL SHAPES [6]:	Flat-Classic, Grooved, Pilaster, Curved, Striped and Vented

VIZORS™

Vizors™ are an enchanting accent to any building façade. Essentially, the addition of long linear elements to the building surface is a clever way to achieve artistic shading and to create the optical illusion of infinite depth.

More importantly, they also provide an effective means of protection from the intense ultraviolet rays of the sun. In summer months, heat gain through an unprotected glass curtain wall can drive energy costs to exorbitant levels. Sunscreens can not only combat this phenomenon but, as mentioned, enhance the aesthetic appeal of the exterior elevation.

Vizors™ are offered in three distinct shapes: Lamella, Baguette and Quad. Each design creates a unique look and can be suspended vertically or horizontally. Lamella and Baguette are available in Brick Red (Natural) and Manganese colors. Quads are available in the full range of NeaCera® Natural and Premium colors.

Lamella

Baguette

Quad

NEACERA®

The Industry's Premium & Affordable Terra-cotta Rainscreen Solution!

AVENERE CLADDING LLC

2801 Sisson Street • Baltimore, Maryland 21211-2902
866/388-8833 • Fax: 410/338-1124 • 410/338-1122
www.avenerecladding.com

09

FORMABOND®

METAL COMPOSITE WALL SYSTEM

CENTRIA

Commerce Bank
University
Mt. Laurel, NJ

Windmere Centre
State College, PA

Bartle Hall Convention Center Ballroom
Kansas City, MO

Comcast
West Chester, PA

FORMABOND® METAL COMPOSITE WALL SYSTEM*

CENTRIA revolutionizes the thin aluminum composite panel industry with FormaBond. Unlike traditional ACM – that's made through lamination, then fabricated into panels by a second party – FormaBond is manufactured entirely by CENTRIA using a proprietary reaction injection molding process. The result is a newly patented, stronger, flatter and finished ACM panel, complete with Rout & Return pressure-equalized joinery.

Patented dry joinery eliminates wet seals and provides optimum venting to allow wall cavities to dry effectively while prohibiting the entry of rainwater, thus reducing the chance of entrapped moisture, material degradation and mold. Specify FormaBond and elevate the quality and integrity of your next ACM wall system.

*Patent No.: US 7,007,433 B2

8mm Pressure-Equalized
Rainscreen Joinery

FEATURES & BENEFITS

- Superior flat panel with crisp and sharp sight line aesthetics
- Low maintenance created by dry seal joinery and installation
- Fire resistant polymeric core meets requirements for all building heights
- Proven pressure-equalized rainscreen joinery design, tested in accordance with AAMA 508-07
- Unique joinery design provides a ventilated cavity along each horizontal joint while minimizing water penetration
- Exceptional impact resistance
- Integrates easily with CENTRIA Formavue windows, C/S Louvers and C/S Sunshades
- Manufactured and fabricated by CENTRIA

DESCRIPTION

SUBSTRATE & CORE
- Metal - 0.032" nominal aluminum face and liner
- Core - Highly cross-linked polymer that meets fire code requirements
- 8mm panel thickness, 2" system depth
- Flat ACM panel systems

JOINERY
All dry construction that is pressure-equalized and provides ventilation to the inner wall cavity.

SURFACE FINISH
- Smooth, Embossed, Braided, Fusion and Honeycomb

PANEL WIDTH
- Up to 60" smooth or embossed textures
- Up to 45" for Braided, Fusion and Honeycomb textures

PANEL LENGTH
- Up to 180"

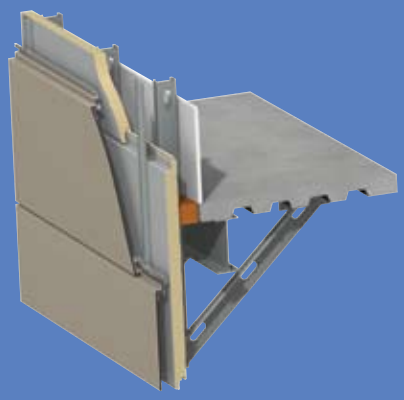
VARIABLE REVEALS
- From 1/2" to 6" in 1/2" increments. May also be colorized.

COATINGS
- Available in micas, metallics, and Fluorofinish

New MetalWrap™

Simplify multiple component metal wall systems with the benefit of CENTRIA's unique foam insulated composite backup system. MetalWrap is designed for use with a variety of CENTRIA products in addition to FormaBond.

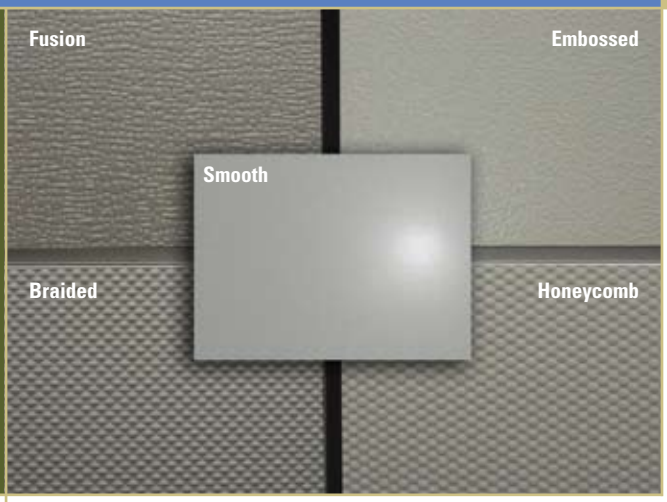
MetalWrap was developed using advanced Thermal Moisture Protection (ATMP) building envelope science. This exciting new product maximizes a metal wall system's ability to effectively control moisture, air and vapor without sacrificing thermal efficiency. Through extensive research and testing, the energy and cost savings of MetalWrap have made it a choice for architects and contractors across the country.



Textures

CENTRIA is pleased to introduce three new FormaBond surface finish textures in addition to smooth and embossed: Braided, Fusion and Honeycomb.

These textures provide more design versatility, while maintaining high quality and low maintenance. All three of the pre-formed aluminum composite panel textures are available with pressure-equalized rainscreen joinery. Coatings are still available in micas, metallics and Fluorofinish.



Surface Finish Options

At CENTRIA, we put our environmental ideas to work through a variety of new and innovative products. CENTRIA's extensive research and development team is in a constant search for new and better ways to adapt products for the best possible end result for our earth.

See for yourself how CENTRIA continues to deliver answers and show measurable results through industry-wide sustainability initiatives.

CENTRIA

800.759.7474
1005 Beaver Grade Road, Moon Township, PA 15108-2944
412.299.8000; Fax 412.299.8317

www.CENTRIA.com

Cover Photo: Bartle Hall
Convention Center Ballroom
Kansas City, MO

Reference FB-5/09 5M NJ/LGT

Printed in U.S.A

TRESPA® METEON® | EXTERIOR

IMAGINE SPECTACULAR FACADES



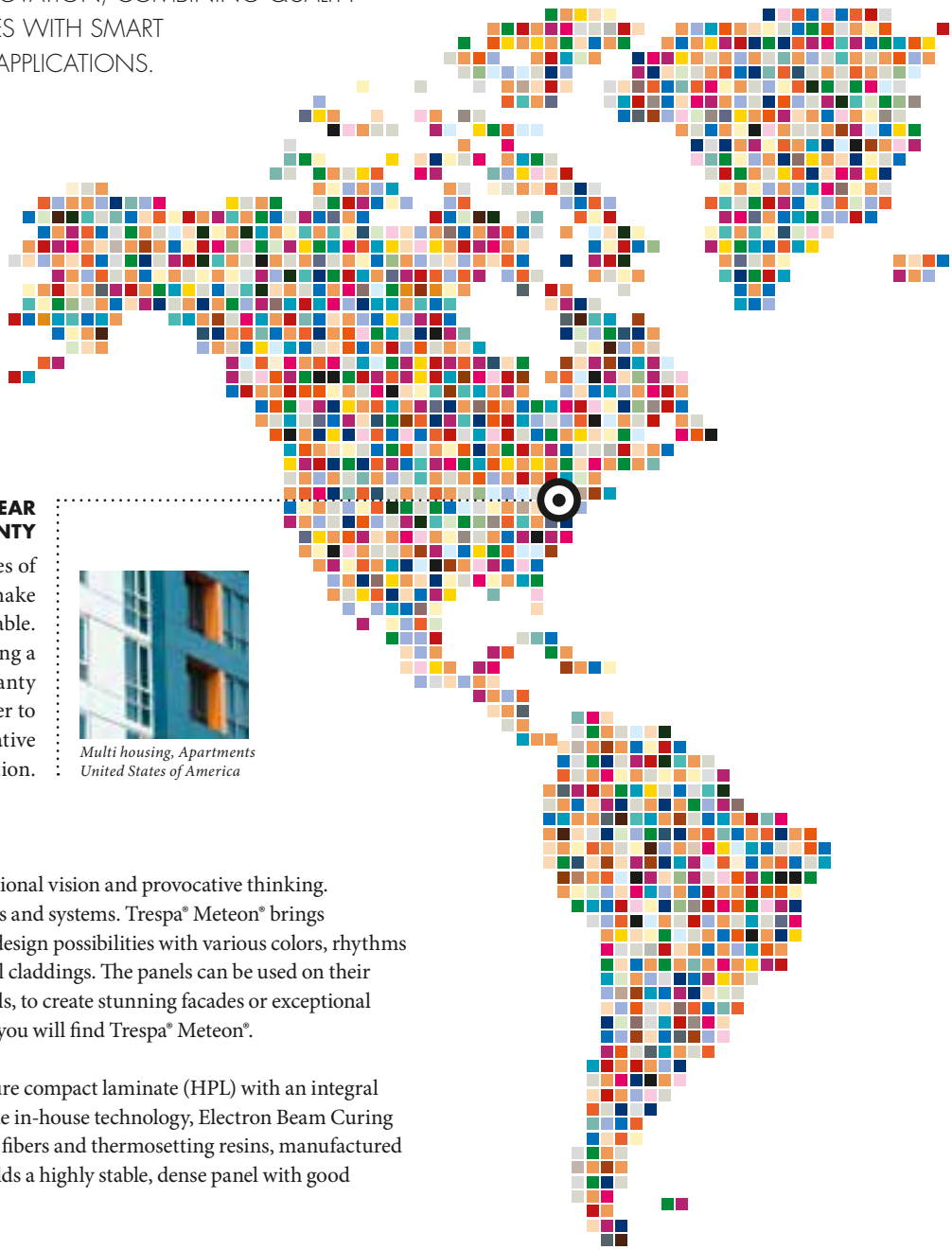
Think Trespa

TRESPA®

TRESPA® METEON®

COLORING THE WORLD

TRESPA INTERNATIONAL B.V. IS A LEADING INNOVATOR IN THE FIELD OF ARCHITECTURAL MATERIALS, RECOGNIZED INTERNATIONALLY AS A PREMIER DEVELOPER OF HIGH QUALITY PANELS FOR EXTERIOR CLADDING AND DECORATIVE FACADES. SINCE ITS FOUNDING IN 1960, TRESPA HAS WORKED CLOSELY WITH ARCHITECTS, DESIGNERS, INSTALLERS, DISTRIBUTORS AND END USERS GLOBALLY. TRESPA BELIEVES IN PRODUCT INNOVATION, COMBINING QUALITY MANUFACTURING TECHNOLOGIES WITH SMART SOLUTIONS FOR ARCHITECTURAL APPLICATIONS.



10-YEAR PRODUCT WARRANTY

The unique properties of Trespa® Meteon® panels make them highly durable. That's why Trespa is offering a ten year conditional warranty on its product. Please refer to your local sales representative for more information.

Multi housing, Apartments
United States of America

WHERE CONCEPT MEETS SOLUTION

Good design starts with inspiration, exceptional vision and provocative thinking. It comes to life with great materials, finishes and systems. Trespa® Meteon® brings compelling aesthetics and nearly limitless design possibilities with various colors, rhythms and depths to next-generation architectural claddings. The panels can be used on their own, or in combination with other materials, to create stunning facades or exceptional highlights. Where concept meets solution, you will find Trespa® Meteon®.

Trespa® Meteon® is a decorative high-pressure compact laminate (HPL) with an integral surface manufactured using Trespa's unique in-house technology, Electron Beam Curing (EBC). The blend of up to 70% wood-based fibers and thermosetting resins, manufactured under high pressures and temperatures yields a highly stable, dense panel with good strength-to-weight ratios.

Trespa® Meteon® stands out in vertical exterior wall coverings such as facade cladding, balcony paneling, sunblinds as well as horizontal exterior ceiling applications.

Public Building | France

COMMITTED TO SAFETY

Trespa is committed to the safety of its processes and products. Two classes of Trespa® Meteon® are available: Standard grade and enhanced Fire-Retardant grade (FR). Please contact your local Trespa representative for local availability.

LOW MAINTENANCE & EASY TO CLEAN

The closed surface of Trespa® Meteon® practically withstands dirt accumulation, keeping the product smooth and easy to clean.

LONG LIFE PERFORMANCE

Trespa® Meteon® is ideal for prolonged exposure as it stays looking great for many years and needs little maintenance. Trespa® Meteon® remains the material of choice for architects today, because they can be sure that it will still define the urban landscape tomorrow.

Education | China

SOLID & STURDY

Consistent and high-density throughout, Trespa® Meteon® holds screws and other mechanical fixings solidly. The panels have good compressive and tensile strength and excellent pullout and impact resistance, yet Trespa® Meteon® is easily machinable and workable like hardwood.

Commercial Office Australia

RESPECT FOR OUR ENVIRONMENT

Trespa strongly believes that any change should start with the company itself. Trespa's approach towards sustainability is framed by the principle 'Do No Harm, Do Good, Do Better' and starts from an objective and fact based analysis (LCA) of its environmental footprint. For more information on Trespa's Life Cycle Analysis, please visit trespa.com.

Leisure, Cultural, Sports Spain

WEATHER RESISTANT & COLOR STABILITY

Trespa® Meteon® performs exceptionally well outdoors. Sun and rain will have no significant effect on the panel's surface.

WIDE RANGE OF VIBRANT COLORS AND FINISHES

Trespa® Meteon® is at the forefront of attractive design and architecture. The product is available in many standard colors and finishes and even custom-made project colors. The acclaimed Naturals and Wood Decors collections offer a wide range of wood grains and organic motifs.

TRESPA®

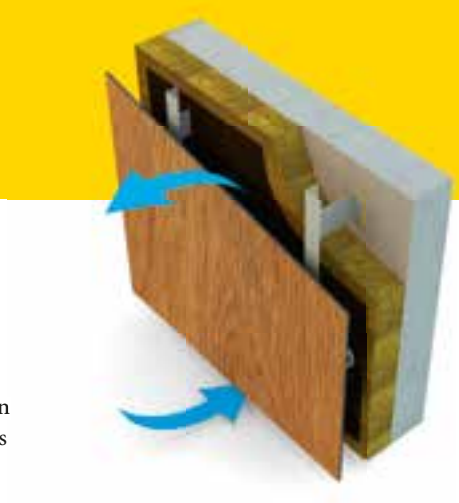
VENTILATED FACADES

Trespa® Meteon® panels are perfect for use in innovative and functional ventilated facade systems. Used on its own or as a highlight in combination with other materials, Trespa® Meteon® determines the look and underlines the qualities of a building.

Trespa is at the forefront of cutting-edge building techniques. Ventilated facades are more than a design gesture - they may provide energy efficient, long-lasting properties.

ADVANTAGES OF VENTILATED FACADE SYSTEMS

- A continuous airflow draws air through the cavity, aiding in the removal of heat and moisture from rain or condensation.
- The rainscreen also blocks parts of the solar radiation and accommodates continuous insulation, which may improve the overall energy performance of the building.
- Residents and users not only find themselves in a low-maintenance-environment, but the dry and comfortable conditions of the building may also have a positive contribution to the indoor environment.



STRONG FOCUS ON SERVICE

As specialist in exterior cladding, Trespa provides knowledge and technical information to aid the design and construction of paneled facades. During all phases of a project, from design and specification to installation, Trespa has a strong focus on service and can provide answers and information to support customers.

Trespa is fully aware that architects wish to realize their specific design going beyond standard solutions. Many customised facades can be realized by offering specific services, especially where Trespa is involved in the early design stage, to give customers detailed advice.

SOLUTION PROVIDING AND VALUE ADDING SERVICES

- **PRODUCT TRAINING SESSIONS**
  Trespa provides training sessions for both installers and designers on topics such as the ventilated facade concept and installation, and product properties and features.
- **TECHNICAL SUPPORT**
  Trespa can guide its partners to achieve optimal technical solutions with appropriate fixing systems.
- **INSTRUCTIONS FOR PANEL HANDLING AND MACHINING**
  High aesthetical quality requires craftsmanship, the right tools and equipment. Trespa will gladly provide advice on these areas.
- **DESIGN SUPPORT**
  Trespa Studio, a multidisciplinary group working on innovative solutions, supporting architects in facade design and offering a special "graphics on facades" service (only available for selected countries), that creates unique images with a random repeat (patent pending).
- **DESIGN CENTRES**
  Trespa Design Centres are based in New York, Barcelona, Santiago de Chile and Weert (the Netherlands). These are unique collaborative spaces inspiring architects, installers and clients. These Centres offer conferences and seminars that facilitate meaningful dialogues with Trespa's partners.
- **INTERNATIONAL CUSTOMER SUPPORT SERVICE**
  Trespa Customer Service Desk is available throughout all the regions in which the company is active.
- **CUSTOM MADE SOLUTIONS**
  Through intensive dialogue with architects and by offering Trespa's customized colors (for projects over 200m² (~ 2,153 ft²)), Trespa has contributed to the realization of many unique facade designs. These customized facade designs are not only beautiful, but also cost effective.

UNI COLOURS

A05.0.0 Pure White	A04.0.0 Cream White	A05.1.0 Papyrus White	A05.1.1 Stone Beige	A08.2.1 Mid Beige	A08.3.1 Stone Grey	A06.7.1 Natural Greige	A08.8.1 Dark Brown
A03.0.0 White	A04.0.1 Pearl Yellow	A07.1.1 Sand	A08.2.3 Salmon	A10.3.4 Terra Cotta	A11.4.4 English Red	A10.4.5 Sienna Brown	A14.7.2 Deep Red Brown
A03.1.0 Pastel Grey	A04.0.2 Pale Yellow	A05.1.2 Champagne	A05.1.4 Sun Yellow	A06.3.5 Ochre	A08.4.5 Rusty Red	A09.6.4 Mahogany Red	A12.6.3 Wine Red
A35.4.0 Cactus Green	A37.2.3 Spring Green	A41.0.6 Mojito Green	A04.0.5 Zinc Yellow	A04.1.7 Gold Yellow	A10.1.8 Red Orange	A12.1.8 Passion Red	A12.3.7 Carmine Red
A33.3.6 Brilliant Green	A36.3.5 Turf Green	A37.0.8 Lime Green	A32.2.1 Translucent Green	A21.1.0 Winter Grey	A24.4.1 Steel Blue	A20.5.2 Lavender Blue	A17.3.5 Cyclam
A34.8.1 Forest Green	A32.7.2 Dark Green	A30.3.2 Verdigris	A22.2.1 Bluish Grey	A28.6.2 Mid Green	A26.5.4 Pacific	A22.4.4 Brilliant Blue	A20.2.3 Light Viola
A25.8.1 Anthracite Grey	A21.7.0 Steel Grey	A28.2.1 Aquamarine	A22.3.1 Ocean Grey	A22.2.4 Powder Blue	A22.1.6 Royal Blue	A21.5.4 Cobalt Blue	A22.6.2 Dark Denim
A11.8.0 Ceramic Greige	A05.5.0 Quartz Grey	A21.5.1 Mid Grey	A03.4.0 Silver Grey	A24.0.3 Polar Blue	A23.0.4 Mineral Blue	A20.7.2 Dark Blue	A90.0.0 Black
A06.5.1 Toscana Greige	A10.6.1 Taupe	A16.5.1 Mauve					

PROJECT COLORS

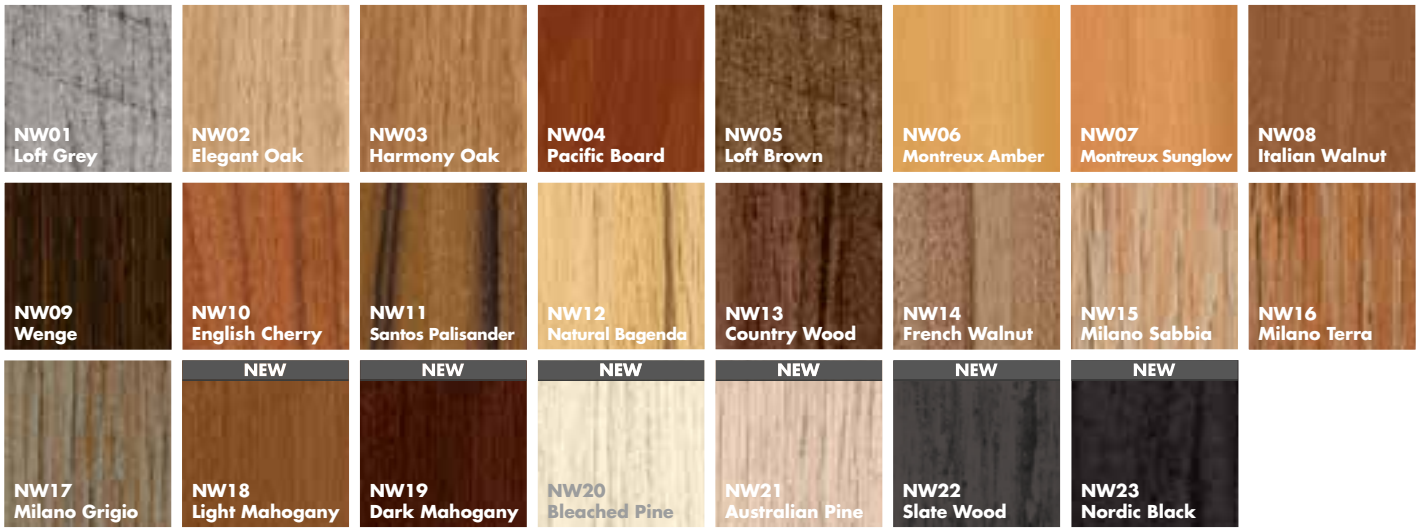
COLOR YOUR IMAGINATION

Trespa® Meteon® architectural panels are available in a wide choice of standard colors and effects. To create facades that are even more individual and expressive, Trespa® Meteon® panels can be custom-made in special project colors. For more information please contact your local Trespa representative.

METALLICS

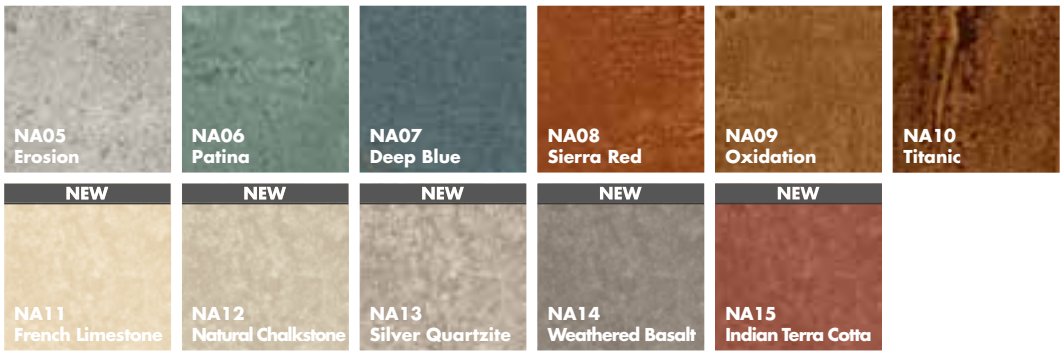
Trespa® Meteon® Metallics panels feature a directional colored surface.

WOOD DECORS



Trespa® Meteon® Wood Decors panels feature a directional colored surface. The grain of Trespa® Meteon® Wood Decors runs the length direction of the panel.

NATURALS



Trespa® Meteon® Naturals panels feature a directional colored surface.

SIZES

4270 x 2130 mm
(≈ 168 x 83 inch)

3650 x 1860 mm
(≈ 143 x 73 inch)

2550 x 1860 mm
(≈ 100 x 73 inch)

3050 x 1530 mm
(≈ 120 x 60 inch)

The large size of this panel allows an efficient machining of the product.

*Note: Full size panels feature a squareness tolerance. please check **trespa.info** for the detailed and up to date Delivery Program and Material Property Datasheet.*

THICKNESSES

6 mm (≈ 1/4 inch)
8 mm (≈ 5/16 inch)
10 mm (≈ 3/8 inch)
13 mm (≈ 1/2 inch)

UNI COLOURS

Colour code	Colour name	Satin				Rock		Gloss
A03.0.0	White	■	■			■		■
A03.1.0	Pastel Grey	■	■	■	■	■	■	
A03.4.0	Silver Grey	■	■	■	■	■	■	■
A04.0.0	Cream White	■	■	■	■	■	■	
A04.0.1	Pearl Yellow	■	■	■	■	■	■	
A04.0.2	Pale Yellow	■	■	■	■	■	■	
A04.0.5	Zinc Yellow	■	■	■	■	■	■	
A04.1.7	Gold Yellow	■	■	■	■	■	■	
A05.0.0	Pure White	■	■	■	■	■	■	■
A05.1.0	Papyrus White	■	■	■	■	■	■	
A05.1.1	Stone Beige	■	■	■	■	■	■	■
A05.1.2	Champagne	■	■	■	■	■	■	■
A05.1.4	Sun Yellow	■	■	■	■	■	■	
A05.5.0	Quartz Grey	■	■	■	■	■	■	
A06.3.5	Ochre	■	■	■	■	■	■	
A06.5.1	Toscana Greige	■	■	■	■	■	■	
A06.7.1	Natural Greige	■	■	■	■	■	■	
A07.1.1	Sand	■	■	■	■	■	■	
A08.2.1	Mid Beige	■	■	■	■	■	■	
A08.2.3	Salmon	■	■	■	■	■	■	
A08.3.1	Stone Grey	■	■	■	■	■	■	
A08.4.5	Rusty Red	■	■	■	■	■	■	
A08.8.1	Dark Brown	■	■	■	■	■	■	
A09.6.4	Mahogany Red	■	■	■	■	■	■	
A10.1.8	Red Orange	■	■	■	■	■	■	
A10.3.4	Terra Cotta	■	■	■	■	■	■	
A10.4.5	Sienna Brown	■	■	■	■	■	■	
A10.6.1	Taupe	■	■	■	■	■	■	
A11.4.4	English Red	■	■	■	■	■	■	
A11.8.0	Ceramic Greige	■	■	■	■	■	■	
A12.1.8	Passion Red	■	■	■	■	■	■	
A12.3.7	Carmine Red	■	■	■	■	■	■	
A12.6.3	Wine Red	■	■	■	■	■	■	■
A14.7.2	Deep Red Brown	■	■	■	■	■	■	
A16.5.1	Mauve	■	■	■	■	■	■	
A17.3.5	Cyclam	■	■	■	■	■	■	
A20.2.3	Light Viola	■	■	■	■	■	■	
A20.5.2	Lavender Blue	■	■	■	■	■	■	
A20.7.2	Dark Blue	■	■	■	■	■	■	■
A21.1.0	Winter Grey	■	■	■	■	■	■	
A21.5.1	Mid Grey	■	■	■	■	■	■	■
A21.5.4	Cobalt Blue	■	■	■	■	■	■	
A21.7.0	Steel Grey	■	■	■	■	■	■	■
A22.1.6	Royal Blue	■	■	■	■	■	■	
A22.2.1	Bluish Grey	■	■	■	■	■	■	
A22.2.4	Powder Blue	■	■	■	■	■	■	
A22.3.1	Ocean Grey	■	■	■	■	■	■	
A22.4.4	Brilliant Blue	■	■	■	■	■	■	
A22.6.2	Dark Denim	■	■	■	■	■	■	
A23.0.4	Mineral Blue	■	■	■	■	■	■	
A24.0.3	Polar Blue	■	■	■	■	■	■	
A24.4.1	Steel Blue	■	■	■	■	■	■	■
A25.8.1	Anthracite Grey	■	■	■	■	■	■	■
A26.5.4	Pacific	■	■	■	■	■	■	
A28.2.1	Aquamarine	■	■	■	■	■	■	■
A28.6.2	Mid Green	■	■	■	■	■	■	
A30.3.2	Verdigris	■	■	■	■	■	■	
A32.2.1	Translucent Green	■	■	■	■	■	■	
A32.7.2	Dark Green	■	■	■	■	■	■	■
A33.3.6	Brilliant Green	■	■	■	■	■	■	
A34.8.1	Forest Green	■	■	■	■	■	■	
A35.4.0	Cactus Green	■	■	■	■	■	■	
A36.3.5	Turf Green	■	■	■	■	■	■	
A37.0.8	Lime Green	■	■	■	■	■	■	
A37.2.3	Spring Green	■	■	■	■	■	■	
A41.0.6	Mojito Green	■	■	■	■	■	■	
A90.0.0	Black	■	■	■	■	■	■	■

*For available sheet sizes and thicknesses for the above finishes, please check **trespa.info** for the detailed and up to date Delivery Program and Material Property Datasheet. Alternatively you can use the Product Selector on **trespa.com** (after choosing the country where the project is located).*

METALLICS

Colour code	Colour name	Satin			Rock		Gloss
M04.4.1	Titanium Silver	■	■	■	■	■	
M05.5.1	Titanium Bronze	■	■	■	■	■	
M06.4.1	Amber	■	■	■	■	■	
M12.4.2	Garnet Red	■	■	■	■	■	■
M20.4.2	Northern Light	■	■	■	■	■	
M21.3.4	Azurite Blue	■	■	■	■	■	■
M21.8.1	Graphite Grey	■	■	■	■	■	■
M24.3.3	Lagoon	■	■	■	■	■	
M34.3.1	Bottle Green	■	■	■	■	■	
M35.7.1	Malachite Green	■	■	■	■	■	■
M40.4.3	Mustard Yellow	■	■	■	■	■	
M51.0.1	Aluminium Grey	■	■	■	■	■	■
M51.0.2	Urban Grey	■	■	■	■	■	
M53.0.1	Copper Red	■	■	■	■	■	■
M53.0.2	Copper Yellow	■	■	■	■	■	■

WOOD DECORS

Colour code	Colour name	Satin		Matt	
NW01	Loft Grey	■	■	■	■
NW02	Elegant Oak	■	■	■	■
NW03	Harmony Oak	■	■		
NW04	Pacific Board	■	■	■	■
NW05	Loft Brown	■	■	■	■
NW06	Montreux Amber	■	■		
NW07	Montreux Sunglow	■	■		
NW08	Italian Walnut	■	■	■	■
NW09	Wenge	■	■	■	■
NW10	English Cherry	■	■		
NW11	Santos Palisander	■	■		
NW12	Natural Bagenda	■	■		
NW13	Country Wood	■	■		
NW14	French Walnut	■	■	■	■
NW15	Milano Sabbia	■	■		
NW16	Milano Terra	■	■	■	■
NW17	Milano Grigio	■	■	■	■
NW18	Light Mahogany	■	■		
NW19	Dark Mahogany	■	■		
NW20	Bleached Pine	■	■	■	■
NW21	Australian Pine	■	■	■	■
NW22	Slate Wood	■	■	■	■
NW23	Nordic Black	■	■	■	■

NATURALS

Colour code	Colour name	Matt	
NA05	Erosion	■	■
NA06	Patina	■	■
NA07	Deep Blue	■	■
NA08	Sierra Red	■	■
NA09	Oxidation	■	■
NA10	Titanic	■	■
NA11	French Limestone	■	■
NA12	Natural Chalkstone	■	■
NA13	Silver Quartzite	■	■
NA14	Weathered Basalt	■	■
NA15	Indian Terra Cotta	■	■

FINISHES

TYPES

■ SINGLE SIDED DECORATIVE: decorative side with non decorative black reverse

■ DOUBLE SIDED DECORATIVE: same color for front and reverse side of the panel

■ VARITOP: decorative side with standard white decorative Satin reverse (A03.0.0)

■ DUOCOLOUR: different color for front and reverse side of the panel

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VERSION 2.2 ▪ BROCHURE CODE V2405 ▪ DATE 08-2013

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TRESPA®

GE Zoneline® packaged terminal air conditioners

2010 contract sales architects and engineers data manual

Quick Reference

Full Specs on pages 52 and 53

ALL UNITS REQUIRE POWER CONNECTION KIT

Power Connection Kit determines resistance heat output
7000 Btuh units are not offered with 4.7 KW resistance heater

4100 Series Cooling with Electric Heat

MODEL NUMBER	COOLING (Btuh)	EER
AZ41E07DA*	7300/7100	12.8/12.8
AZ41E09DA*	9450/9250	12.3/12.3
AZ41E12DA*	11800/11600	11.8/11.8
AZ41E15DA*	14700/14500	10.6/10.6
AZ41E07EA*	7300	12.8
AZ41E09EA*	9450	12.3
AZ41E12EA*	11800	11.8
AZ41E15EA*	14700	10.6

Dry Air 25
4100 Series Cooling with Electric Heat

MODEL NUMBER	COOLING (Btuh)	EER
AZ41E07DAP	6800/6600	12.2/12.2
AZ41E09DAP	9000/8800	11.8/11.8
AZ41E12DAP	11200/11000	11.3/11.3
AZ41E07EAP	6800	12.2
AZ41E09EAP	9000	11.8
AZ41E12EAP	11200	11.3

6100 Series Heat Pump with Backup Electric Heat

MODEL NUMBER	COOLING (Btuh)	EER	REVERSE CYCLE BTUH	COP
AZ61H07DA*	7200/7000	13.2/13.2	6400/6200	4.0/4.0
AZ61H09DA*	9400/9200	12.7/12.7	8300/8100	3.8/3.8
AZ61H12DA*	11800/11600	12.1/12.1	10600/10400	3.7/3.7
AZ61H15DA*	14800/14600	11.2/11.2	14000/13900	3.3/3.3
AZ61H07EA*	7200	13.2	6400	4.0
AZ61H09EA*	9400	12.7	8300	3.8
AZ61H12EA*	11800	12.1	10600	3.7
AZ61H15EA*	14800	11.2	14000	3.3

4100 and 6100 Series Control Panel

*Dual-rated 230/208-volt units are shown with ratings separated by "/".
Units with single rating are 265-volt units.

Power Connection Kits

230/208-Volt Line Cord Connection Units

Line Cord Kit	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK3153A	8150/7900	2400/2320	11.0/11.6	15
RAK3203A	11200/10900	3300/3200	15.1/16.0	20
RAK3303A	16000/15450	4700/4530	21.2/22.4	30

Electric Heat Amps include electric heater and fan motor current draw.
Each Line Cord Kit has an integral Leakage Current Detection and Interruption (LCDI) or Arc Fault Current Interrupter (AFCI) device as required by National Electrical Code (NEC) and Underwriters Laboratories (UL) for units manufactured after August 1, 2004.

230/208-Volt Sub-Base and Direct Connected Units

Sub-Base	Direct Connection Kit	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK204D15P	RAK4157	8150/7900	2400/2320	11.0/11.6	15
RAK204D20P	RAK4207	11200/10900	3300/3200	15.1/16.0	20
RAK204D30P	RAK4307	16000/15450	4700/4530	21.2/22.4	30

Electric Heat Amps include electric heater and fan motor current draw.
Units connected through sub-base do not require an LCDI or AFCI device since they are not considered to be line-cord connected. Each 230/208-volt sub-base kit consists of sub-base with appropriate receptacle for minimum circuit amperage, chaseway to route power connector from sub-base to chassis, wiring to connect sub-base to building wiring and a short line cord with 9-pin connector to connect to chassis and plug into receptacle in sub-base.
Short sub-base line cord may not be used without sub-base.
Junction box for 230/208-volt chassis must be purchased separately.
RAK4002A for 2900, 3900, 4100, and 6100 series units, RAK4002B for 5800 series units.

265-Volt Sub-Base and Direct Connected Units

Sub-Base	Power Connection Kit	Direct Connection Kit	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK204E15	RAK5172	RAK5157	8150	2400	9.6	15
RAK204E20	RAK5202	RAK5207	11550	3400	13.3	20
RAK204E30	RAK5302	RAK5307	16350	4800	18.6	30

Electric Heat Amps include electric heater and fan motor current draw.
265-volt units are to be permanently connected in compliance with National Electrical Code and local codes and have a factory-installed junction box on the chassis.
Each 265-volt sub-base kit consists of sub-base with appropriate receptacle for minimum circuit amperage, chaseway to route power connector from sub-base to chassis and wiring to connect sub-base to building wiring.
265-Volt Power Connection Kit must be ordered separately.

Important

Essential Elements Ordering Overview

230/208-volt line cord connected units — order line cord kit

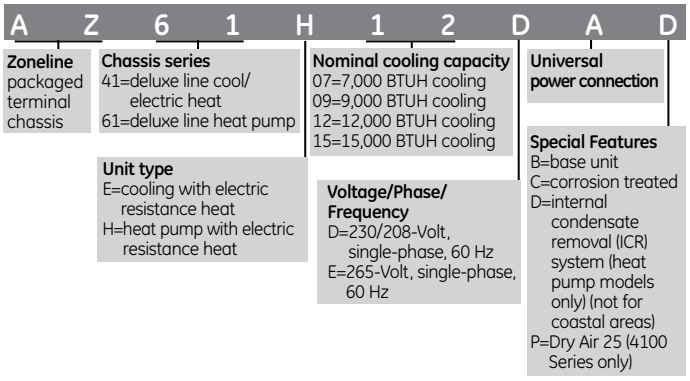
230/208-volt sub-base connected units — order sub-base

265-volt units — order sub-base and power connection kit

Zoneline® Chassis Nomenclature

The Zoneline chassis is identified by a model number defining the type of unit, cooling capacity, electrical information and optional features included on the unit. When specifying or ordering the Zoneline chassis, the use of this nomenclature will assure receiving the correct unit.

EXAMPLE



The Zoneline® 4100 and 6100 Series have incorporated changes suggested by customers, along with enhancements by GE's Technology Team and changes necessary to meet new UL and NEC requirements.

"L" shaped condenser coil.

Cross flow blower across the product line for quieter operation.

The "Partial Open Vent Air" feature was a specific request by a customer.

"Heat Sentinel" is an enhancement developed by GE's Technology Team to help lodging professionals welcome their guests with a moderate-temperature room and to help lower cooling costs.

Devices have been added on cord-connected units to protect against injury from unsafe power cords.

See the "Features and Benefits" section for in-depth explanation of these changes and the industry-leading features of GE Zoneline retained from the previous series.

The Deluxe 4100 Series Zoneline models include The "Dry Air 25" models which remove 25% more moisture than other Zoneline models.

Deluxe Dry Air 25 Models
Cooling With Resistance Heat

- Removes 25% more moisture than standard Zoneline models.
- Cools and dries air in less time than standard Zoneline models
- Dry Air is a separate sealed refrigerant system
  — No mechanical parts — No special maintenance required
- Helps maintain lower relative humidity in rooms
- Maintains comfort at slightly higher room temperatures
  — Reduces operating costs — Provides comfort without overcooling
- Corrosion treatment is standard
- Excellent choice for humid climates
- Available in 7000, 9000 and 12000 BTU sizes

The Dry Air 25 system, a heat pipe, is a hermetically sealed heat transfer surface installed in a "saddlebag" configuration around the indoor (evaporator) coil of the Zoneline unit. This coil arrangement will transfer heat from the front coil of the saddlebag to the rear coil without power consumption. This assembly uses R-410A as the refrigerant and is not connected to the regular Zoneline refrigerant circuit.

As warm, humid air is pulled through the pre-cool (front) section of the heat pipe, the heat removed from the air is absorbed by the refrigerant, causing the refrigerant to change to a gas and flow to the re-heat (rear) section of the heat pipe. The air leaving the pre-cool section of the heat pipe is cooler and at a higher relative humidity level than the room air. The pre-cooled air is further cooled as it passes through the evaporator; consequently allowing the evaporator coil to remove more moisture.

When the cold air from the evaporator comes in contact with the re-heat section of the heat pipe, the heat that was removed by the pre-cool section is added back to the air and the refrigerant in the heat pipe condenses and flows back to the pre-cool (front) section. The air discharged into the room by this process is much drier, creating a more comfortable room condition.

The Dry Air 25 models center around GE's exclusive use of the patented Dinh® Dehumidifier Heat Pipe from Heat Pipe Technology, Inc. This innovative NASA spin-off technology enables Dry Air 25 to remove 25% more moisture from the air than other leading manufacturers' packaged terminal air conditioners. This helps maintain room comfort at a higher room temperature, reducing operating costs.

The Dry Air 25 keeps a room cool and dry, and this is the most important benefit when it comes to the occupant of the room—hotel guests, apartment residents, students. In a hot, humid climate, getting away from the humidity is just as important as getting away from the heat, and the Dry Air 25 is the perfect solution. The dehumidification of the Dry Air 25 has been verified by the same ARI test conditions that standard units are rated under.

Table of Contents

Important Notice

Equipment used as a primary source for heating or cooling is an integral part of the building in which it is installed. Proper application is essential for satisfactory performance over a wide range of operating conditions. It is strongly recommended that a professional engineer determine proper application.

If the unit is a replacement unit, its specifications and performance may differ from those of the unit it is replacing. For that reason, we again strongly recommend that a professional engineer determine proper application.

Introduction

This manual is designed to provide product, performance and application information to our customers and their architects and engineers for use in selection and design of a zonal comfort control system utilizing GE Zoneline® Packaged Terminal Air Conditioners (PTAC) and Packaged Terminal Heat Pumps (PTHP). GE Zoneline PTACs and PTHPs are self-contained units designed for through-the-wall installations in hotels, motels, apartments, hospitals, nursing homes, add-on rooms and many other installations.

Zoneline units provide individual room or zone control in both cooling and heating operation. There is a model for practically every application, ranging in cooling capacity from 7,200 to 14,800 BTUH and heating capacity from 6,400 to 14,000 BTUH in heat pump operation. See pages 42 and 54 for resistance heaters available.

Zoneline offers a two-tier lineup: The ***Deluxe Line*** consists of the 4100 Series with electric resistance heat, the 4100 Series Dry Air 25 Models with enhanced dehumidification for hot and humid climates and the 6100 Series heat pump. The 6100 Series heat pump features reverse cycle defrost and simultaneous supplemental resistance heat, when needed, to maintain room comfort. Both offer tactile touch controls with digital display and optional corrosion protection.

Deluxe Line Standard Features:

- Two-fan-motor system with Indoor Cross-Flow Blower for quieter operation
- Digital Controls
  - —LED Temperature Display
  - —Easy Temperature Selection
  - —Tactile Touch Pad
- Universal Heaters
- Heat Sentinel
- "L" Coil Design Condenser
- 3-Position Vent Door
- Freeze Sentinel™
- Indoor Coil Frost Control
- Central Desk Control Interface
- Remote Thermostat Control Interface
- Random Restart
- Electronic Temperature Limiting
- "Smart Fan" Fan Cycle/Continuous Control
- Transfer Fan Interface
- Reverse Cycle Defrost and Simultaneous Supplemental Resistance Heat on Heat Pumps
- Quick Heat Recovery

Deluxe Line Optional Features:

- Corrosion Protection
- Internal Condensate Removal (on 6100 Series Heat Pump without Corrosion Protection)

NOTE: Dry Air 25 models include all the standard features of the 4100 Series plus standard corrosion protection.

Advantages of the GE Zoneline System:

- Flexible Application
  - —May be installed from flush to finished floor to 3" from the ceiling
  - —7,200 to 14,800 BTUH units in same physical size
  - —Deluxe 4100 and 6100 Series may be ducted to condition more than one room
  - —Compatible with Class 2 remote thermostat control
  - —Compatible with 2-wire CDC or many Energy Management Systems
- Economical Installation
  - —No ductwork necessary
  - —No mechanical equipment rooms or pipes required for heating/cooling units
  - —Replacement units fit existing 42"-wide by 16"-high wall cases
- Quiet Operation
  - —Indoor cross-flow blower
- Energy-Saving Operation
  - —Units in unoccupied areas may be turned off
  - —Designed for efficient cooling operation — EERs from 10.6 to 13.2
  - —Efficient heat pump units — COPs from 3.3 to 4.0
  - —Extended heat pump operation without sacrificing room comfort
- Ease of Maintenance
  - —Permanently lubricated fan motors
  - —Upfront lift-out interchangeable filters
  - —Slide-out chassis for easy access for cleaning or if service is required
- Reverse Cycle Heat Pump Operation

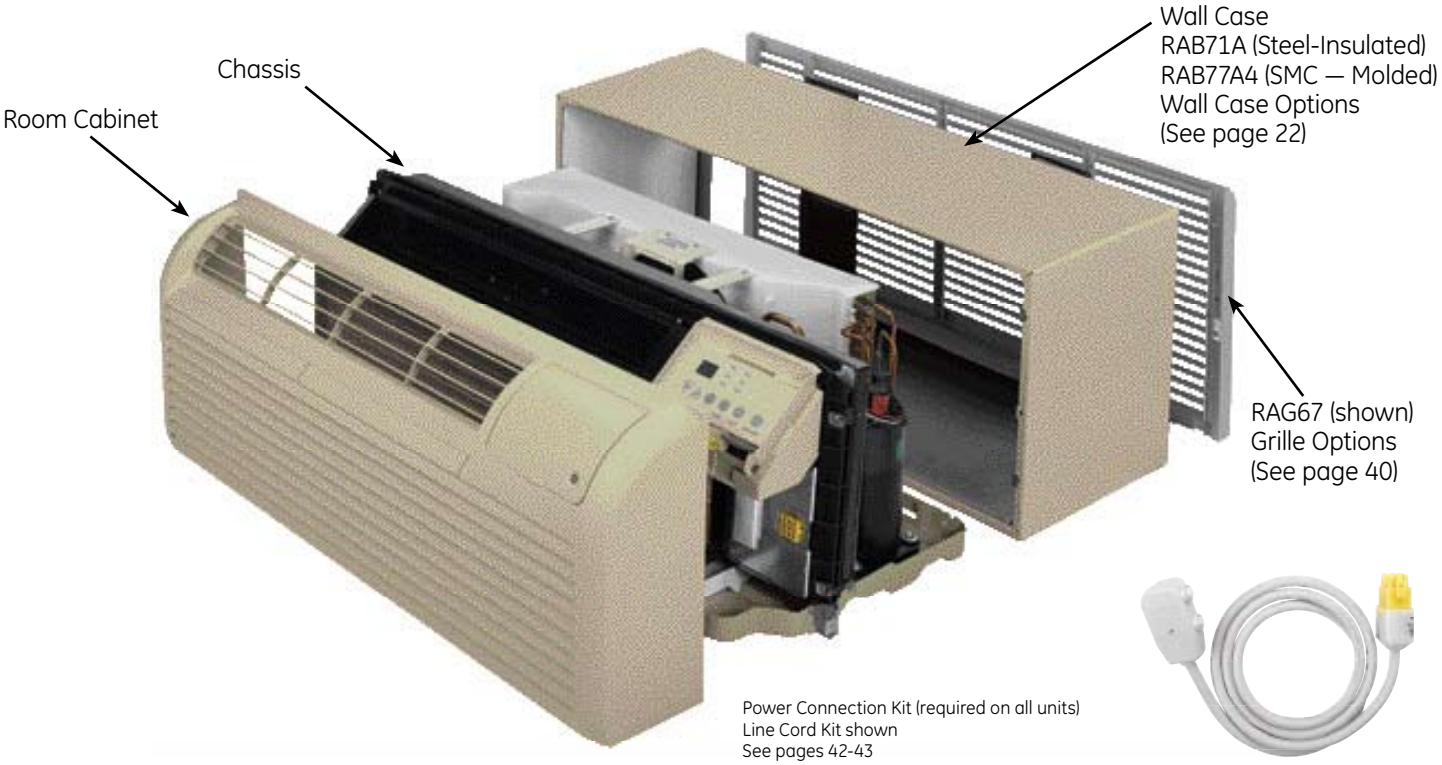
The 6100 Series heat pumps utilize the unique GE PTAC heat pump operation to ensure a comfortable room. The logic used by the units is the same logic used by central system heat pumps to provide greater savings.

The Zoneline System

The typical Zoneline installation consists of the wall case (or sleeve), chassis, power cord and exterior grille. Some installations may use a sub-base for support of the unit or for ease of electrical connections. Each of the components should be the standard products offered by GE or, in the case of the exterior grille, approved by GE Applications Engineering. Use of components not specifically designed or approved for use with the Zoneline unit can result in unsatisfactory operation and can be the cause of failure not covered by the warranty.

Components of the Zoneline System

Typical Installation (Deluxe Series shown)



Power Connection Kit (required on all units)
Line Cord Kit shown
See pages 42-43

Power Supply Cord

Optional Accessories of the Zoneline System

RAK204D20P Sub-Base (shown)

RAK6052 Duct Adapter

Power Supply Cord (included with 208V/230V sub-bases)

RAK601/602
Duct Extension, Register and Trim Flange

See pages 22 and 32 for information on electrical sub-bases and chaseway.
See pages 37-39 for information on ducted installations.

Zoneline® Features

	Resistance heat		Heat pump
	AZ 41 Series	**AZ 41 Dry Air 25**	**AZ 61 Series**
Cooling EER Range (230 Volts/265 Volts)	10.6 - 12.8	11.3 - 12.2	11.2 - 13.2
Heating COP Range (230 Volts/265 Volts)	N/A	N/A	3.3 - 4.0
Refrigerant type	R-410A	R-410A	R-410A
Cross-flow (tangential) blower	Standard	Standard	Standard
Enhanced Dehumidification	Optional	Standard	—
Heat pump with resistance heat back-up	—	—	Standard
Heat pump with supplemental resistance heat	—	—	Standard
Staged Heating	—	—	3-Stage***
Universal heaters - UPC**	Standard	Standard	Standard
Tactile touch pad controls with LED	Standard	Standard	Standard
Touch control set-up features	Standard	Standard	Standard
Highly featured microcomputer controls	Standard	Standard	Standard
Electric resistance heat lock-out (above 46°F)	—	—	Standard
Automatic emergency heat	Standard	Standard	Standard
Heat pump defrost system	—	—	Reverse cycle
High-Temperature Operation Protection	—	—	Standard
Quick heat recovery	—	—	Standard
Temperature Boost	—	—	Selectable
Separate Indoor & Outdoor Motors — Permanently Lubricated	AC	AC	DC
2-Speed Outdoor Fan	Standard	Standard	Standard
Indoor fan speed settings	Hi/Low	Hi/Low	Hi/Low
Fan Only setting—2-speed	Hi/Low	Hi/Low	Hi/Low
Cool & heat only settings	Hi/Low/Auto	Hi/Low/Auto	Hi/Low/Auto
"SmartFan" Fan Cycle Control	Standard	Standard	Standard
Auto power recovery	Standard	Standard	Standard
Automatic Compressor Restart Delay	Standard	Standard	Standard
Freeze Sentinel™ (41F)	Standard	Standard	Standard
Heat Sentinel (85F)	Standard	Standard	Standard
Automatic indoor frost control	Standard	Standard	Standard
Temperature limiting	Electronic 7-step	Electronic 7-step	Electronic 7-step
Solid-state thermostat	Standard	Standard	Standard
Remote thermostat compatibility	Standard	Standard	Standard
Central desk control compatibility	Standard	Standard	Standard
2-position discharge grille 50°/40°	Standard	Standard	Standard
Upfront filter (interchangeable)	Standard	Standard	Standard
3-position manual air vent control	Standard	Standard	Standard
Sleep function	Standard	Standard	Standard
Transfer Fan Connections	Standard	Standard	Standard
Ducted Installation Capability	Optional	Optional	Optional
Corrosion-treated chassis	Optional	Standard	Optional
Internal condensate removal (ICR)*	—	—	Optional

*Not for use in corrosive environments
**UPC — Universal Power Cord Connection (see pages 42 and 54).
*** Two stage heating if using remote thermostat
265-volt units must be connected in a manner to meet National Electrical Code and all local codes.

Features and Benefits

Standard Physical Dimensions

GE has maintained the same dimensions since 1961 — 42" wide x 16" high x 13-3/4" deep

Replacement of older units is made easy.

Weather-Protected Electrical Components

Vital electrical components are protected from the weather by locating them on the indoor side of the weather barrier.

Weather-Resistant "Superseal"

Properly installed unit in undistorted case keeps air leakage to a minimum.

7 CFM air infiltration with 25 MPH wind on ICR units — even less on units without ICR.

Industry specification is 19 CFM of air infiltration.

Heater Sizes to Meet Room Requirements

All units are equipped with a universal heater — the resistance heat output is determined by power connection kit.

230/208-volt — Line-Cord Connected Units — 2.4/2.32 KW with RAK3153A — 15-amp circuit; 3.3/3.20 KW with RAK3203A — 20-amp circuit; 4.7/4.53 KW with RAK3303A — 30-amp circuit.

230/208-volt - Sub-Base Connected Units — 2.4/2.32 KW with RAK204D15P — 15-amp circuit; 3.3/3.20 KW with RAK204D20P — 20-amp circuit; 4.7/4.53 KW with RAK204D30P — 30-amp circuit.

265-volt — 2.4 KW with RAK5172 — 15-amp circuit; 3.4 KW with RAK5202 — 20-amp circuit; 4.8 KW with RAK5302 — 30-amp circuit.

Unit Controls

4100 and 6100 Series — touch pad controls with digital readout of temperature set point.

Highly Featured Microprocessor Controls

Microprocessor controls are programmed to interface with the temperature sensors to maximize comfort conditions for the room occupant and provide outstanding features.

Thermistors are used to sense small changes in temperature to give excellent room control and allow the microprocessor to monitor and react to changing conditions.

Electric Resistance Heat Lock-Out

To maximize the savings of the heat pump operation, the Zoneline heat pumps do not utilize the resistance heater when the outdoor temperature is above 46°F during normal operation. The resistance heat is used in the Quick Heat Recovery feature.

Automatic Emergency Heat

Automatically uses electric resistance heat if the heat pump output is not sufficient to maintain selected room temperature.

Reverse Cycle Heat Pump Defrost System

Standard on all Zoneline 6100 Series heat pumps.

Enables heat pump to operate at lower temperatures when other systems switch to more expensive electric resistance heat.

See pages 18 and 19 for discussion of heat pump operation and defrost systems.

High-Temperature Heat Pump Operation Protection

Automatically protects the compressor if heat pump is operated with high outdoor temperatures.

Power to the outdoor fan is turned off if the indoor coil gets too hot during heat pump operation to prevent damage to the compressor.

Quick Heat Recovery – Heat Pump Units

When the unit operation is changed from STOP or COOL to HEAT, the electric resistance heaters are used to warm the room to the thermostat set point. This provides faster room temperature increase for greater guest comfort.

Fan Motors – Permanently Lubricated

All units have two fan motors for quiet operation and maximum operating efficiency.

Motors are permanently lubricated to reduce maintenance and totally enclosed to keep dirt and water out of the motor windings.

Outdoor Fan

The unit automatically selects the most efficient speed for the outdoor fan. The operating sound level is lower when the outdoor fan can operate in low speed yet there are situations where it must operate in high speed. The unit changes the fan speed automatically.

Indoor Fan Speed Selections – HIGH/LOW

Unit may be operated in HIGH HEAT or LOW HEAT or HIGH COOL or LOW COOL.

Features and Benefits

Fan-Only Setting – HIGH/LOW

The unit provides the option of selecting either HIGH or LOW speed for Fan-Only operation.

Fan-Cycle Switch – "SmartFan"

Unique "SmartFan" allows unit to operate fan continuously in cooling operation and fan cycle in heating to provide better guest comfort. Eliminates complaint of cold air draft during heating operation.

Eliminates need of changing fan-cycle switch seasonally.

"SmartFan" settings are controlled via the auxiliary control setting push button.

Compressor Random Restart

In the event of a power failure, all compressors attempting to restart immediately when power is restored can result in a power surge that can cause another power interruption.

The microprocessors in the Zoneline® units have a random restart logic system that prevents all units from starting at the same time.

Rotary Compressor

Smoother operation for quiet, dependable service. GE has used rotary compressors since 1961.

Compressor Restart Delay

Zoneline units are designed to provide a minimum of three minutes of compressor off time to allow refrigerant pressures to equalize before restarting to prevent compressor damage.

Zoneline units are also designed to provide a minimum of three minutes of compressor run time to prevent room occupant disturbance due to short-cycling of the air conditioner.

Freeze Sentinel™

Detects low room temperature and turns on heater to help protect against damage caused by freezing room temperature.

Heater turns on at 41°F and warms indoor thermistor temperature to 46°F and shuts off.

Freeze Sentinel may be turned off by dip switch on auxiliary control.

Heat Sentinel

The property owner may choose to activate the Heat Sentinel feature on the Zoneline unit. If the Heat Sentinel is activated and room temperature reaches 85°F while the unit is in the "STOP" setting, the unit will automatically start in air conditioning operation and will shut off when the room temperature reaches 80°F. This will help dehumidify the air and lower high temperatures so the guest will not be entering an extremely hot room.

Indoor Coil Frost Control

Prevents indoor coil from freezing and causing complaints due to lack of cooling. Frost can form on the indoor coil when the unit is operated in cooling when outdoor temperatures are low. The unit automatically shuts the compressor off until the indoor coil temperature warms to the point where frosting will no longer occur.

Transfer Fan Interface

24 VAC terminals are provided to operate a relay to control a fan mounted in a wall to move conditioned air into another space. The electrical power for the operation of the transfer fan itself is not provided by the Zoneline unit. Transfer fans and their controlling relays are field supplied.

Electronic Temperature Limiting

Seven independent programmable heating temperature limits and seven independent programmable cooling temperature limits.

Heating Temperature Limits							Highest Heat
65	70	72	74	76	78	80	85
Lowest Cool	**Cooling Temperature Limits**						
60	64	66	68	70	72	74	76

Limits are set via the auxiliary control setting push button.

Remote Control Capability with Wall-Mounted Thermostat

See pages 15–17.

Central Desk Control Capability

See page 14.

Energy Management System Interface with Load-Shedding Option

All units have a switch via the auxiliary control setting to allow the indoor fan to continue operating if the unit is connected to an energy management system that shuts off compressor or heater operation. By allowing the indoor fan to run when the heater or compressor is shut off by the energy management system, the guest is less likely to realize the operation of the unit has been altered. This helps reduce peak energy demand loads without disturbing the room occupant.

Reversible Indoor Air Louvers

Allows air to be directed into room at 40° or 50° angle to provide better air distribution.

Angle is changed by removing room front and screws holding louver in place, and rotating louver section.

Features and Benefits

Up-Front Air Filters

Two interchangeable up-front filters, easy to remove and reinstall, may be cleaned without opening or removing the room front.

Clean filters by brushing, vacuuming or back-flushing under faucet or shower head.

Concealed Manual Vent Control

Open ventilation doors on GE Zoneline® Packaged Terminal Air Conditioners and Heat Pumps allow outside air to enter the room through a screen-covered opening in the weather barrier that separates the indoor and outdoor sections of the unit.

A concealed lever is located along the left side of the unit under the front cover is used to open and close the vent door.

The 3-position manual vent door control may be closed, partially open or fully open. Positive vent door closure prevents accidental opening and unwanted air infiltration.

Vent CFM High Speed

Unit	Full Open	Partial Open
7000	50	40
9000	70	45
12000	75	45
15000	75	45

CFM ratings at 230 and 265 volts.

For each CFM of air to enter the room, an equal amount of air must be removed through exhaust fans in the bathroom or roof tops. Greater amounts of air will be introduced (from chart shown above) depending on the size of the exhaust fan.

Outside ambient air entering the room through this screened vent opening is not conditioned. This unconditioned air becomes mixed with the conditioned air that is circulated by the indoor fan. This air mixture generates an additional heat load/heat loss that causes the unit to run longer and may translate into higher operating costs.

Zoneline vent openings are not intended to be the source of make-up air for building ventilation systems due to the additional heating or cooling loads generated.

Corrosion Protection (Optional)

4100 and 6100 Series units may be ordered with special protection to better withstand damage from salt air and salt water in seacoast areas.

Corrosion protection is standard on the Dry Air 25 models.

Heat pump units with ICR are not available with corrosion protection and should not be installed in seacoast or corrosive environments.

Units installed in corrosive areas should use the RAB77 wall sleeve and be examined/cleaned more frequently than normal installations.

Internal Condensate Removal (ICR)

See page 34 for a discussion of the Internal Condensate Removal system available on 6100 Series heat pumps.

Enhanced Dehumidification

Moisture removal is an important function of an air conditioner. People are more comfortable at higher temperatures when the humidity level is relatively low. Air conditioners operate with less energy consumption when the room temperatures are set higher.

The GE Zoneline 4100 Series with the Dry Air 25 heat pipe application removes 25% more moisture than the base 4100 Series unit.

The GE Zoneline Dry Air 25 chassis is the only PTAC available with the application of the patented Dinh® Dehumidifier Heat Pipe under license from Heat Pipe Technology, Inc.

Customers who are using the Dry Air 25 report a fresher-smelling room as a result of the lower humidity levels, as well as lower operating costs.

Locking Door Kit

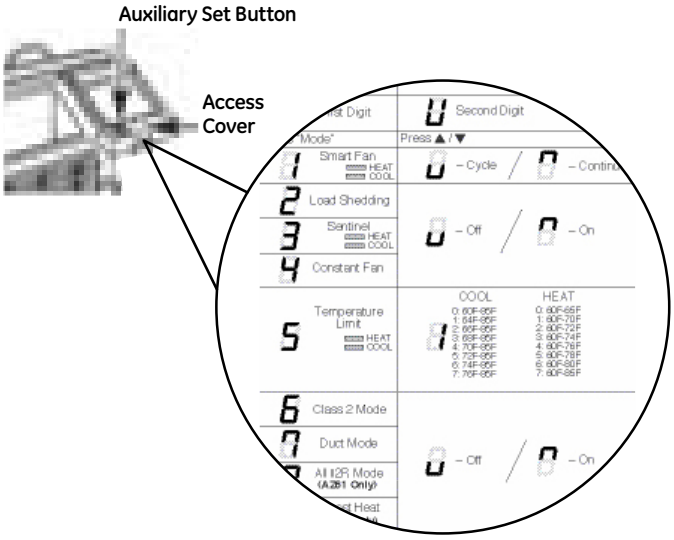
RAK8023 — A door with a lock that replaces the standard control cover door to prevent unauthorized changing of control setting is offered as an accessory.

Auxiliary Control—Aux Set Button

The auxiliary control push button is located behind the room cabinet, below the control panel. The auxiliary controls come preset to the modes most desired by customers. However, the owner is responsible for ensuring the auxiliary controls are set to the desired function. There are 9 different modes that can be set using the auxiliary set button.

To change modes:

- Press AUX SET ("AU" appears on the display).
- Press the MODE button on the control pad until the first digit in the display shows the number corresponding to the mode you are choosing and the correct HEAT/COOL LED is lit.
- Press the up or down arrow to change the mode setting selection (second digit in the display).
- Press the MODE button to move to the next feature or the AUX SET button to exit the set up process.



Press "AUX SET"	
A First Digit	U Second Digit
Press "Mode"	Press ▲ / ▼
1 Smart Fan HEAT COOL	U – Cycle / n – Continue
2 Load Shedding	U – Off / n – On
3 Sentinel HEAT COOL	
4 Constant Fan	
5 Temperature Limit HEAT COOL	1 COOL: 0: 60F-65F, 1: 64F-65F, 2: 66F-65F, 3: 68F-65F, 4: 70F-65F, 5: 72F-65F, 6: 74F-65F, 7: 76F-65F / HEAT: 0: 60F-65F, 1: 60F-70F, 2: 60F-72F, 3: 60F-74F, 4: 60F-76F, 5: 60F-78F, 6: 60F-80F, 7: 60F-85F
6 Class 2 Mode	U – Off / n – On
7 Duct Mode	
8 All 12R Mode (A261 Only)	
9 Boost Heat (A261 Only)	

Auxiliary Control Settings

Mode 1—Smart Fan—Cooling/Heating
The default setting for Mode 1 is as follows:
Cooling: Continuous (ON)
Heating: Cycle (OFF)

Press "SET"	
First Digit A	Second Digit U
Press "Mode" 1 HEAT COOL	Press ▲ / ▼ U Smart Fan Cool – Cycle / n Smart Fan Cool – Continue
Press "Mode" 1 HEAT COOL	Press ▲ / ▼ U Smart Fan Heat – Cycle / n Smart Fan Heat – Continue

Mode 2—Load Shedding (Central Desk Control)
The default setting for Mode 2 is OFF.
This feature is active only if the unit is connected to a CDC and the CDC has control. When this mode is on, only the indoor fan can be turned ON or OFF with the unit controls. When this mode is off, all operation is disabled except Heat/Freeze Sentinel (Mode 3).

Press "Mode"	
2	Press ▲ / ▼ U Load Shedding – Off / n Load Shedding – On

Auxiliary Control Settings (cont)

Mode 3—Freeze Sentinel/Heat Sentinel
The default settings for Mode 3 are:
Heat Sentinel is off
Freeze Sentinel is on.
When Freeze Sentinel is activated, it automatically provides heat without user interface. This helps to prevent plumbing damage by turning the heater and indoor fan ON at 41°F and OFF at 46°F.
When Heat Sentinel is activated, it automatically provides cooling without user interface. This helps to prevent an excessively hot room by turning the air conditioner ON at 85°F and OFF at 80°F.
*NOTE: These functions are active whenever the unit is plugged in, even if the unit is in the STOP positio*n.

Mode 4—Constant ON Fan
The default setting for Mode 4 is OFF.

Mode 5—Temperature Limiting
The default setting for Mode 5 is as follows:
Cool: 0 (60°F to 85°F)
Heat: 7 (60°F to 85°F)

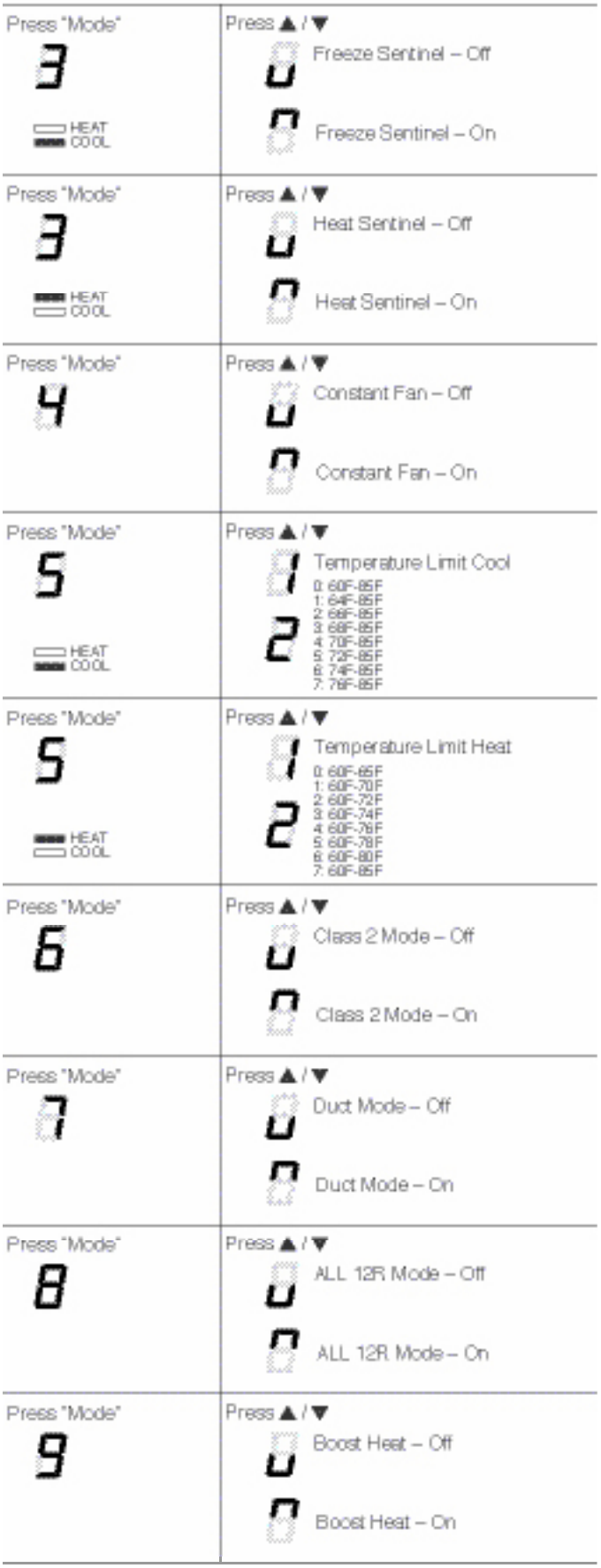
Temperature limits—Cool	**Temperature limits—Heat**
0 = 60°F to 85°F	0 = 60°F to 65°F
1 = 64°F to 85°F	1 = 60°F to 70°F
2 = 66°F to 85°F	2 = 60°F to 72°F
3 = 68°F to 85°F	3 = 60°F to 74°F
4 = 70°F to 85°F	4 = 60°F to 76°F
5 = 72°F to 85°F	5 = 60°F to 78°F
6 = 74°F to 85°F	6 = 60°F to 80°F
7 = 76°F to 85°F	7 = 60°F to 85°F

Mode 6—Remote Thermostat – Class 2
The default setting for Mode 6 is OFF.
Setting this mode to ON will allow the unit to operate with a Class 2 Remote Control Wall Thermostat.

Mode 7—Duct Mode
The default setting for Mode 7 is OFF.
This setting is used when the unit is installed using a duct adapter kit. If the unit is ducted, the Duct Mode needs to be set to ON. This increases the fan speed to ensure proper circulation.

Mode 8—All-Electric Heat (AZ6100 only)
The default setting for Mode 8 is OFF.
This electric heat option functions only on the 6100 model. When this option is ON, heat pump operation is locked out, causing the unit to provide only electric resistance heat.

Mode 9—Heat Boost (AZ6100 only)
The default setting for Mode 9 is OFF.
When Heat Boost is ON and outer temperatures are between 25°F and 46°F, heat pump only operation is locked out. This setting is used to provide supplementary heat to the heat pump operation by electric resistance heat in conditions where the heat pump-only operation is not sufficient to maintain a consistent, comfortable room temperature. **NOTE: Temperature Boost option should NOT be used with remote thermostat operation. This will cause the unit to switch to resistance heat when the outdoor temperature is 46°F.**



Central Desk Control

Some installations may want to govern the ability of the unit to operate from a control device remote to the unit or even remote to the room in which the unit is located. The general term given to systems such as this is Central Desk Control. The most common installation of this type of system is a switch mounted at the registration desk and, upon guest check-in, a button is pushed or a switch is moved to allow the air conditioner to operate. Likewise, when the guest checks out the device is put into the "OFF" position so the unit will not operate while the room is vacant.

It is not necessary that the controlling device be located at a central desk to employ a device that will control the unit operation. For instance, in some resort areas devices are connected to sliding glass doors and opening the door causes a contact to close, turning the air conditioner off. This prevents energy being wasted by operating the air conditioner when warm, humid air is entering the room. Some systems operate by motion sensors or heat-sensing detectors mounted in the room. These types of systems determine occupant presence in the room and allow the unit to operate; if no one is in the room the device signals the air conditioner to turn off.

Zoneline® models offer load-shedding capabilities on units connected to Central Desk Control systems. For more information on the models' load-shedding feature, see page 10.

There is a wide variety of devices available, each with its own benefits and constraints. While GE does not offer components that are external to the unit for a Central Desk Control (CDC) system, GE Zoneline units are compatible with most CDC and energy management systems. **Zoneline units provide a 24 VAC circuit that powers the Central Desk Control system and no external power is needed.**

All Zoneline 4100 and 6100 Series units are compatible with simple on/off 2-wire Central Desk Control systems. Consult with the provider of the energy management system to be sure it is compatible with GE Zoneline units. Zoneline units have standard connectors factory-installed to provide a CDC interface that permits the unit to be connected to most of the energy management systems. The devices connected to the Zoneline units require no power supply or transformers external to the unit.

Important CDC Comments (all series applicable)

1. When the switching device closes the circuit of the CDC conductors, the unit operation stops.
2. Do not use a common bus (at the unit or at the switch panel) in the wiring. Both wires comprising the circuit must connect to the unit connectors and to the controlling switch. Running one wire from one unit to another unit is common busing and may damage internal components or cause erratic operation of the system.
3. A 24-volt transformer is contained within the Zoneline unit. No external voltage may be applied to the unit through the CDC terminals. (Voltage on the CDC conductors is 24 volts AC.)
4. Recommended wire size must be followed as a minimum requirement.

Wire Size #AWG	Maximum Allowable Length
#22	600 Ft.
#20	900 Ft.
#18	1500 Ft.
#16	2000 Ft.

Freeze Sentinel™ and Heat Sentinel remains operational when the unit is connected to a CDC system. Even if the unit is turned "OFF" at the central location, if the sensor at the unit detects the low or high limit temperature, the unit will automatically turn on until it reaches the preset shutdown temperature (46°F heating, 80°F cooling).

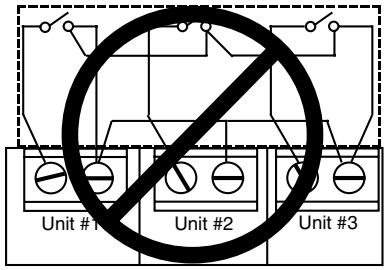
Connecting the Zoneline unit to a CDC system does not eliminate the ability to connect the unit to a remote thermostat. Once the circuit is "opened," and control of the unit removed from the CDC system, the selected controls—either the unit—mounted control or the remote thermostat—govern the operation of the unit.

Please see page 55 for installation recommendations for the Central Desk Control wiring.

CDC Terminal Location and Typical Wiring

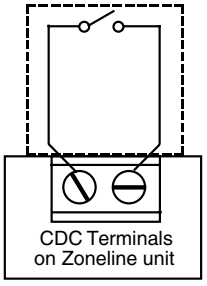
See page 15 for location of CDC terminals on unit.

Example of Common Busing NOT PERMITTED



INCORRECT Common Busing

Normally Open Switch - Unit Operational



Typical Wiring
(All Wiring Shown Is Field Supplied)

Remote Thermostat Control

In some installations, control of the operation of the unit at a location remote from the unit itself may be desired. A unit mounted high in the wall or over a door, for instance, where the unit-mounted controls are inaccessible, can be connected to a wall-mounted thermostat. Other installations may use remote thermostat control for design or performance enhancement. The unit is connected to the thermostat by low-voltage wiring which permits the operation of the unit to be selected and the temperature sensed at the thermostat.

Important Notes: Remote thermostat wiring should NOT be run through wall case. Thermostat wiring should exit the wall below the unit and enter the unit between room cabinet and chassis. Wire molding may be used to hide thermostat wiring. If a sub-base is used, the thermostat wiring may be concealed by the sub-base. Thermostat wiring should NOT be run parallel to line voltage wires since induced current may cause erratic operation.

All Zoneline 4100 and 6100 Series units are adaptable to Class 2 remote low-voltage thermostat. The only additional field-supplied components are the remote thermostat and wiring necessary to connect it.

The controls on the unit are not functional when the remote control function is used.

Resistance Heat Models

The Zoneline 4100 resistance heat units may be connected to a single-stage thermostat designed for use with cooling with electric heat systems. GE offers two thermostats compatible with the 4100 Series unit.

RAK164D1 — a solid-state digital thermostat requiring five connection wires.

RAK164P1 — a solid-state digital programmable thermostat requiring five connection wires.

The remote thermostat-Class 2 option (Mode 6 in the auxiliary control setting) must be turned ON to enable remote thermostat control. Refer to installation instructions packaged with the chassis.

Please see page 55 for installation recommendations for the remote thermostat wiring.

Compatibility of other thermostats considered for use with GE Zoneline units is the responsibility of the customer. The control voltage on the remote control conductors is 24 volts AC. The AC voltage may not be compatible with some solid-state thermostats.

The fan speed for the 4100 Series in remote thermostat operation is selected by the connection of the fan wire from the thermostat to either the HIGH or LOW terminal on the unit. See the sketch of the unit terminals below for the location of the HIGH and LOW fan-speed terminals. Operating the unit in low fan speed reduces the operating sound level of the unit.

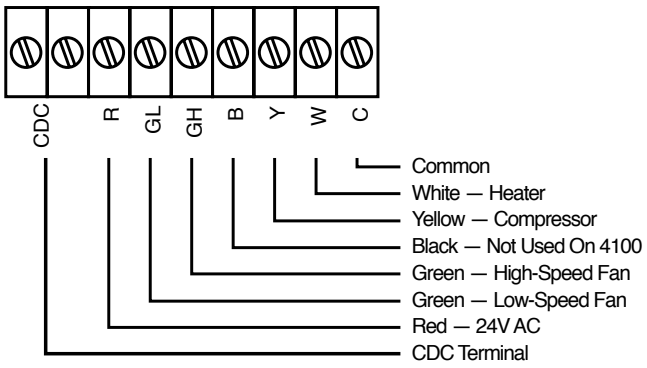
Freeze Sentinel™ and Heat Sentinal remain operational if the unit is connected to a remote thermostat. The unit may be connected to a Central Desk Control (CDC) system and controlled with a remote thermostat when the CDC system has the unit in operation. See page 14 for additional information on the CDC system.

Unit temperature limiting settings are not functional when unit is connected to a remote thermostat.

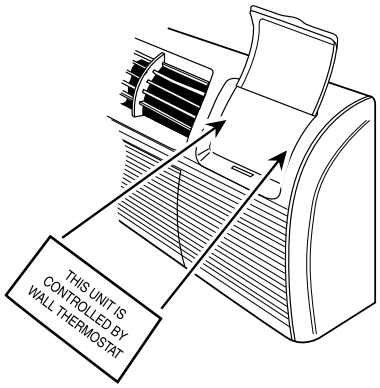
Field Wiring Terminal

R — 24V AC
GL — Low-Speed Fan
GH — High-Speed Fan
B — Not Used on 4100
Y — Compressor
W — Heater
C — Common

RAK806 Universal Control Cover Label



When a Zoneline unit is using a remote thermostat control, the RAK806 Universal Control Cover Label is recommended. The RAK806 is only available in a package of 10 labels. The label is placed over the control panel to direct the user to the wall thermostat for operation of the Zoneline unit.



Remote Thermostat Control

Heat Pump Models

The Zoneline® 6100 Series heat pump units may be connected to a single-stage cooling/two-stage heating thermostat designed for use with heat pump systems. GE offers two thermostats compatible with the 6100 series units:

RAK148D1 — solid-state digital thermostat requiring six connection wires.

RAK148P1 — solid-state digital programmable thermostat requiring six connection wires.

Please see page 55 for installation recommendations for the remote thermostat wiring. Compatibility of other thermostats considered for use with the GE Zoneline unit is the responsibility of the customer.

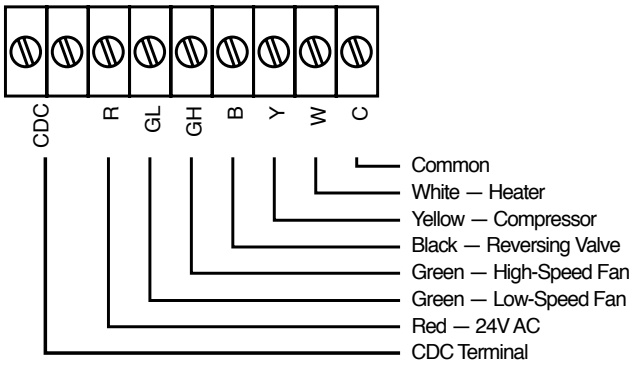
The control voltage on the remote control conductors is 24 VAC.

The remote thermostat-Class 2 option (Mode 6 in the auxiliary control setting) must be turned ON to enable remote thermostat control. Refer to installation instructions packaged with the chassis.

The ***fan speed*** for the 6100 Series in remote thermostat operation is selected by the connection of the fan wire from the thermostat to either the HIGH or LOW terminal on the unit. See the sketch of the unit terminals for the location of the HIGH and LOW fan speed terminals. Operating the unit in low fan speed reduces the operating sound level of the unit.

Field Wiring Terminal

R — 24V AC
GH — High-Speed Fan
Y — Compressor
C — Common
GL — Low-Speed Fan
B — Reversing Valve
W — Heater



Feature	Heat Pump	Electric Heat
Indoor Frost Control	Yes	Yes
Freeze Sentinel™	Yes	Yes
Heat Sentinel	Yes	Yes
Auto Fan Speed	No	No
Electronic Temperature Limiting	No	No
Switch to Resistance Heat Based on Indoor Temperature	Determined by Remote Thermostat	N/A
Switch to Resistance Heat Based on Outdoor Temperature	Yes	N/A
Reverse Cycle Defrost	Yes	N/A
Simultaneous Resistance Heat with Heat Pump	No	N/A
Resistance Heat Lockout	Yes	N/A
"Smart Fan" Fan Cycle	Fan ON/AUTO Set On Remote Thermostat	Fan ON/AUTO Set On Remote Thermostat
Central Desk Control	Yes	Yes

When connected to a remote thermostat, the indoor-air-temperature sensing is shifted from the unit to the remote thermostat. For this reason, the units will operate slightly differently when connected to a remote thermostat. The above chart shows the unit operation when connected to a remote thermostat.

Boost heat option should NOT be used with remote thermostat operation since this will cause the unit to switch to resistance heat when outdoor temperatures are below 46°F.

Remote Thermostat Control Selection Chart For Zoneline Packaged Terminal Units

Zoneline Series	Thermostat Model	Type	Function	Low-Voltage Conductors
4100	RAK164D1	Digital	Cooling and Heating	5
	RAK164P1	Digital Programmable		5
6100	RAK148D1	Digital	Single-Stage Cooling – 2-Stage Heating	6
	RAK148P1	Digital Programmable		6

Thermostat wire size – up to 60 feet AWG20 – up to 66 feet AWG18

For remote thermostat operation follow the steps below:

1. Turn on the unit and ensure it is working properly BEFORE proceeding.
2. Unplug the unit or disconnect power and remove the room cover.
3. Connect the thermostat wiring per the appropriate diagram/colors for your model.
4. Plug the unit back in or reconnect power.
5. Press the Aux Set button once. The letters AU will appear in the display.
6. Press the mode button until the number “6” appears in the left hand digit.
7. Press the up arrow once so the top half of the right hand digit is lit.
8. Press the Aux Set button to exit the setup function.
9. Replace the room cover.

See pages 12 and 13 for full instructions on using the Auxiliary Controls Feature.

Heat Pumps and Energy Savings

- GE Zoneline® heat pumps are designed to provide cost-efficient heat pump operation while monitoring room conditions to maintain comfort.

The units employ a logic system monitoring both outdoor and indoor temperatures to determine the heat source, thus increasing energy savings by operating longer in the heat pump mode.

Heat pumps save energy and cost less to operate than units with electric resistance heaters as the only heat source. Just as the EER of an air conditioner is an indication of the efficiency of the unit, COP (Coefficient of Performance) is the indication of the efficiency of the heat pump. This relative efficiency of a heat pump compares the unit to electric resistance heat. If a unit has a COP of 3.0, it means the unit will produce three times as much heat at rating conditions for the same electrical input wattage used for electric resistance heat.

The compressor is used in heat pump operation just as in air conditioning operation. In heat pump operation, the hot refrigerant gas is directed to the indoor coil rather than to the outdoor coil. Room air that circulates over the indoor coil gains heat from the coil rather than losing heat to the coil as during cooling operation.

As the outdoor temperature falls, the heat pump is able to extract less heat from the outdoor air to raise the temperature of the indoor air. For this reason, all packaged terminal heat pumps also have electric resistance heaters as backup to heat pump operation. At some point, the heat pump is unable to provide sufficient heat to adequately warm the room. Many Packaged Terminal Heat Pumps cease heat pump operation and change to more expensive resistance heat at some pre-determined outdoor temperature to compensate for the inability of the heat pump to maintain room temperature. This point, called the "switchover point," is usually at an outdoor temperature where savings from heat pump operation may still be realized if the unit is designed to maintain room comfort at the lower outdoor temperatures.

Balance Point

An important consideration in the selection of a heat pump unit is the "balance point" of the installation. Virtually every room is unique—with different insulation, different sizes and types of windows, different types of construction, different directional exposures. All these variables, as well as geographical location, must be considered in order to determine the balance point, the point at which the heat pump is unable to produce enough heat to compensate for the heat loss of the room or area being heated. For these reasons a consulting engineer should be engaged to calculate the heat loss and specify the heat pump unit required.

GE offers the 6100 series of Zoneline heat pump units—with highly featured microprocessor controls—react to the indoor temperature as well as the outdoor temperature in determining the heat source to provide comfortable room conditions and energy savings. This determination of the heat source based on the indoor temperature helps provide a more comfortable room.

Heat Pumps and Energy Savings

Heat Pump Operation — Zoneline 6100 Series

Heat sources: Heat pump, heat pump and simultaneous electric resistance heat or electric resistance heat.

Zoneline heat pumps employ a highly featured microprocessor control system interfaced with thermistors to accurately measure indoor air temperature, outdoor air temperature, indoor coil temperature and outdoor coil temperature. This system allows the microprocessor to precisely and predictably react to changing conditions in order to provide a very advanced packaged terminal heat pump operating system.

The Zoneline heat pumps are designed to help ensure a comfortable room. When "HEAT" is selected, the unit will determine if the room air is warm enough to satisfy the thermostat setting. If the temperature at the unit sensor is below the desired temperature, the electric resistance heater will be utilized to warm the room to the point where the thermostat is satisfied. This feature is designed to allow the temperature of an unoccupied room to be maintained at an energy-saving level without inconveniencing the room occupant. Once the thermostat has been satisfied, the resistance heater will turn off and the heat pump will operate as shown in the Heat Source Logic chart until the thermostat calls for heat again. The unit will operate in this manner even if connected to a Central Desk Control.

Zoneline Heat Pump Heat Source Logic

ROOM TEMPERATURE VS. THERMOSTAT SET POINT	Above 46°F	Between 46°F and 25°F	Below 25°F
Less Than 1.8°F Below	Heat Pump	Heat Pump*	Full Resistance Heat
1.8°F to 2.7°F Below	Heat Pump	Heat Pump + Supplemental Heater	Full Resistance Heat
More than 2.7°F Below	Heat Pump	Full Resistance Heat	Full Resistance Heat

The Boost Heat option utilizes the supplemental simultaneous heater at the same time as heat pump operation when the outdoor temperature is below 46°F regardless of the indoor air temperature**. The chart above indicates the heat source of the heat pump under various indoor and outdoor conditions. The unit is designed to provide heat pump savings without sacrificing room comfort.

The Quick Heat Recovery feature is not affected by the Heat Source Logic shown in the chart below. For more information about the Quick Heat Recovery Feature, see page 9. The full heat output of the resistance heater is dependent upon circuit amperage and the power connection kit used. See pages 3 and 42–43 for information on power connection kits and available heater capacities.

An option is provided in the auxiliary controls (Mode 8) to allow the unit to operate only in resistance heat. The use of this option significantly increases the cost for heating.

Heat pump defrost — Zoneline 6100 Series

Zoneline heat pumps utilize a reverse-cycle demand defrost system to extend heat pump operation and increase savings from extended operation. The microprocessor determines the need for defrosting by criteria based on continuous compressor running time, outdoor air temperature, outdoor coil temperature and the rate of temperature change of the outdoor coil. When defrosting is required, the unit reverses the flow of refrigerant to direct the hot gas into the outdoor coil to melt the frost buildup. Before and after the reverse-cycle defrosting, the unit shuts off the compressor to allow the refrigerant pressures to equalize throughout the system. This eliminates the possibility of a loud reversing noise. During these periods of pressure equalization, the full resistance heat capacity of the unit is activated to help ensure room comfort conditions during the defrost cycle. The unit remains in the defrost cycle for a minimum of two minutes up to a maximum of nine minutes. The defrost cycle terminates when the outdoor coil reaches a temperature of 68°F or the maximum time has been reached.

Heat pump condensate

See page 34 for information on heat pump condensate. The Zoneline 6100 Series heat pumps may be ordered with a factory-installed Internal Condensate Removal (ICR) system to minimize the amount of condensate water draining from the unit during heat pump operation. The ICR system has proven to be an effective means of minimizing the amount of heat pump condensate dripping from the unit. However, if the requirements of a particular installation will allow no dripping of condensate water from the wall case, the installation of an internal or external drain system is recommended.

Units with ICR may not be installed in seacoast or corrosive environment applications.

*If the Boost Heat switch (auxiliary setting #9) is "ON", the supplemental simultaneous heater will be used with heat pump operation. Simultaneous supplemental heater: 1.0 KW @ 230 V; 0.8 KW @ 208V; 1.0 KW @ 265V.

**Boost Heat option only applies to systems controlled at the unit. Boost Heat option should NOT be used with remote thermostat operation since this will cause the unit to switch to resistance heat when outdoor temperatures are below 46°F.

Application Comments

Use and Care Manual and installation instructions are shipped with Zoneline® units. It is important that any air conditioning system be properly sized and applied in order to achieve the desired temperature and humidity levels in the space to be conditioned. Zoneline units are designed primarily to provide heating and cooling with the additional benefit that during operation in the cooling mode, the units also remove some moisture from the conditioned space. The following are some brief application comments on undersizing, oversizing, heating, wall coverings, and air infiltration: all are important in the proper matching of the heating/air conditioning system to the building structure.

Undersizing: If an air conditioner is undersized (cooling capacity is less than required for a specific application), the unit will typically not be able to cool the space down to the desired temperature (thermostat set point), nor be able to remove enough moisture from the air. A result could be a warm and humid or warm and dry conditioned space.

Oversizing: If an air conditioner is oversized (cooling capacity is greater than required for the specific application), the unit will typically cool the space down to the desired temperature (thermostat set point) too quickly. The compressor then begins to cycle on and off. Dehumidification only takes place when the compressor is operating. A typical result in a hot/humid climate could be a cool but excessively humid space.

Heating: Undersizing can result in not being able to maintain the desired temperature level within the conditioned space.

Wall Covering: Use of a non-permeable wall covering (some paints, some wallpapers, and other types of coverings) which severely restricts passage of air or water vapor can cause a severe moisture problem. Typical results could be staining of room surfaces, wall damage, as well as mold and mildew growth in hot/humid climates.

Air Infiltration: Excessive air infiltration can magnify problems associated with undersizing or oversizing of an air conditioner unit and can be the root cause of insufficient cooling, dehumidification, or heating. Some sources of air infiltration include vents, gaps around windows and doors, and improperly sealed floor, ceiling and wall joints.

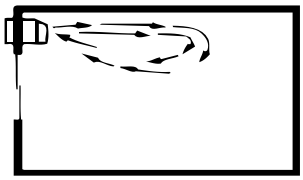
Recommendation: For the above reasons it is strongly recommended that a professional engineer be retained to match the Zoneline unit with the building structure.

Air Distribution

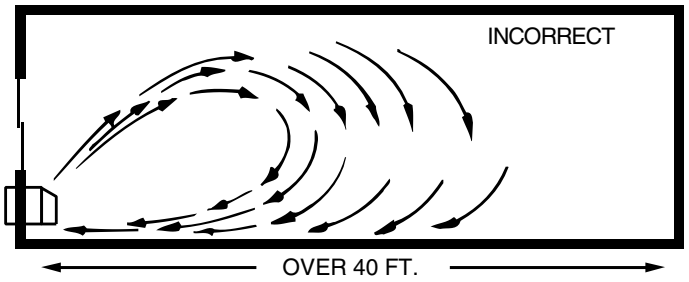
Zoneline packaged terminal air conditioners and heat pumps discharge air from the top of the unit through reversible two-position discharge louvers. Unit discharge louvers are reversed by removing the room cabinet from the unit, removing seven screws that hold the louver section in place, removing the louver section and rotating it end for end, reinstalling the louver section in the room cabinet with the seven screws, and reinstalling the room cabinet on the unit. The unit is shipped from the factory with the discharge louvers at an angle of 50° off vertical. In the alternate position, the louvers will be at an angle of 40° off vertical.

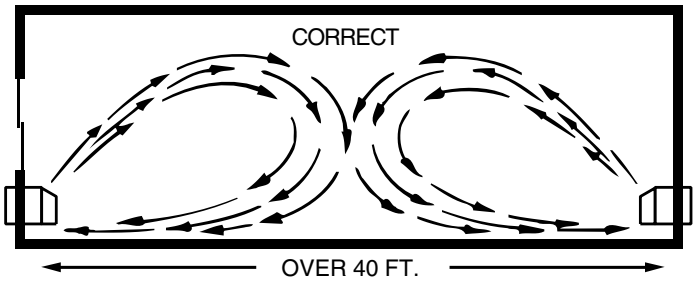
All room cabinets return air through the front of the unit.

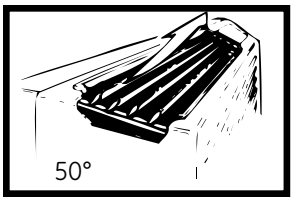
High Wall Mount — For units mounted high in the wall, the discharge louvers should be at a setting that provides the most horizontal air discharge. Recommended installation is at least 3" below the ceiling. In installations where units are close to the ceiling, the greatest horizontal discharge angle can be obtained by removing the discharge grille from the room cabinet.

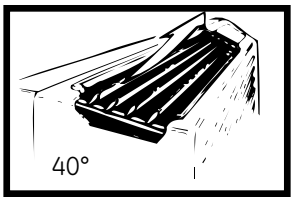


Supply Air Throw — One Zoneline unit should not be required to do a job obviously requiring two or more units. Units should be located around large rooms according to calculated loads or in such fashion as to achieve balanced air distribution in all parts of the room. The single unit in the "Incorrect" illustration below obviously cannot condition the entire room. Add a second unit as shown in the "Correct" illustration.





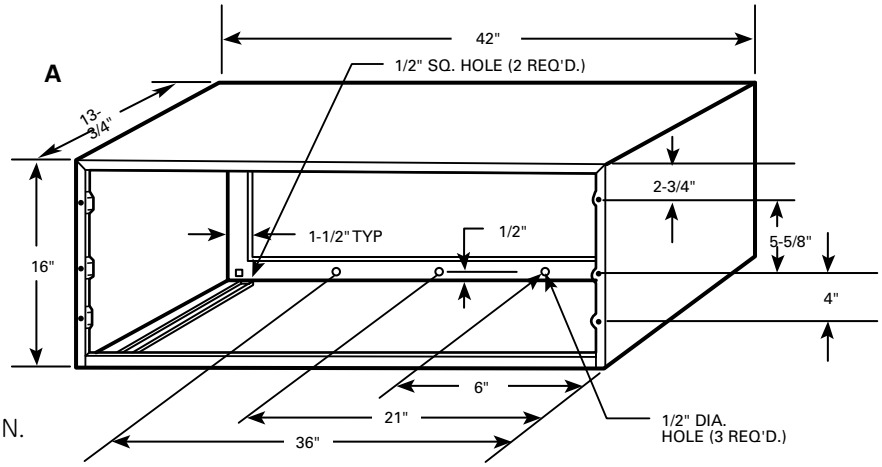




Dimensions

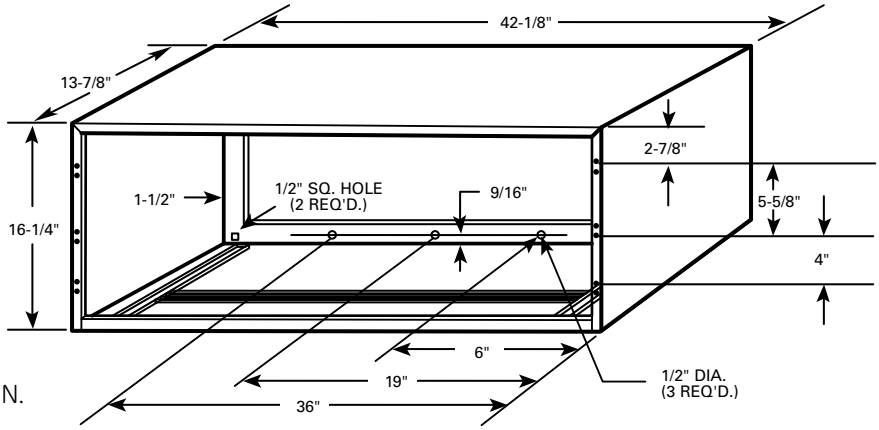
Additional
Wall Case Depths
RAB7116 - 16"
RAB7124 - 24"
RAB7128 - 28"
RAB7131 - 31"

RAB71A WALL CASE



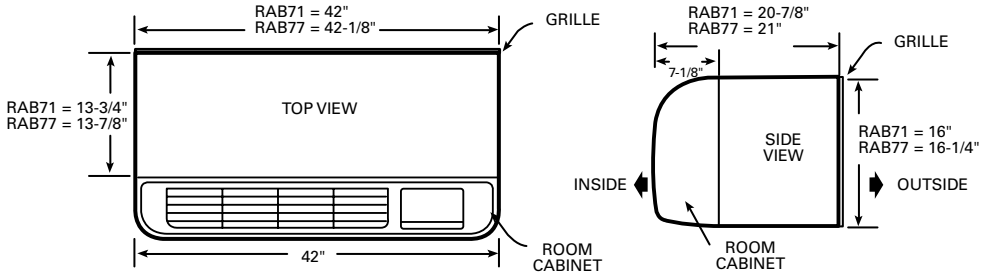
WALL OPENING
16-1/4" MIN. x 42-1/4" MIN.

RAB77 WALL CASE

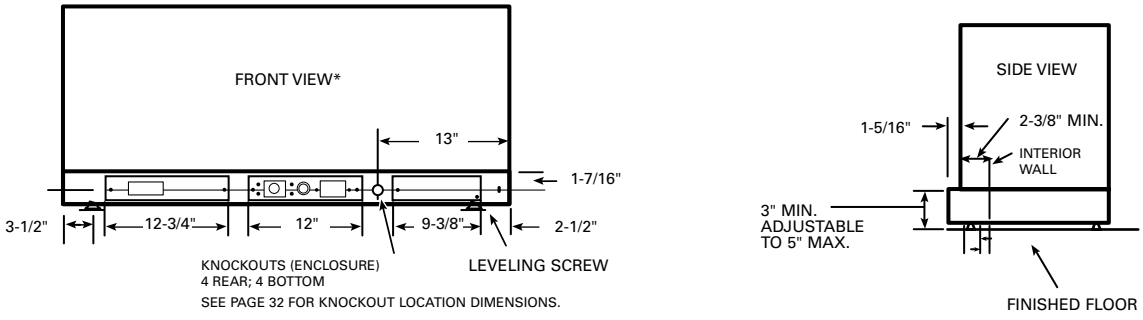


WALL OPENING
16-1/2" MIN. x 42-3/8" MIN.

WALL CASE WITH CHASSIS INSTALLED



WALL CASE WITH SUB-BASE



*SHOWN WITH ACCESS COVERS REMOVED.
NOTE: CAUTION - REMOVE KNOCKOUTS FROM INSIDE OUT.

Installation instructions packed with wall case. See page 25 for additional information concerning outdoor weather panel and case stiffener.

Wall Case

A choice of wall cases is available for Zoneline®units.

RAB71A — This insulated case is constructed of heavy-gauge galvanized steel and finished with a baked-enamel finish for protection and appearance. Design of the case provides for support of the chassis and free draining of any water entering the wall case. A petroleum microcrystalline wax is applied at critical points of fabrication to seal against moisture. The dimensions of the RAB71A wall case are 42" wide by 16" high by 13-3/4" deep, the same dimensions as the original wall case for GE Zoneline units built in 1961. The RAB71A wall case is also available in depths other than the standard depth. It is available on special order as: **RAB7116 – 16" deep; RAB7124 – 24" deep; RAB7128 – 28" deep; and RAB7131 – 31" deep**. All these special-order deep wall cases are insulated and have sheet-metal dividers, or splitters, to prevent the recirculation of condenser discharge air.

RAB77 — This non-insulated wall case is molded from fiberglass-reinforced polyester compound. This SMC (Sheet-Molded Compound) wall case offers outstanding strength, durability, color retention, water integrity and corrosion resistance. The dimensions of the RAB77 wall case are 42-1/8" wide by 16-1/4" high by 13-7/8" deep.

- Both wall cases are of universal design, accepting all Zoneline chassis of current design as well as all GE Zoneline chassis produced since 1961.
- Drain holes are provided in the rear of the wall case to permit excessive cooling condensate water, heat pump condensate or precipitation entering the wall case to drain freely. A drain kit may be connected to the wall case to control any water draining from the wall case. See page 35 for information on **RAD10 Drain Kit**.

RAK901L — For installations where the wall case extends into room, RAK901L is an insulation kit that can be used with the RAB77 or any existing non-insulated wall case to minimize the possibility of condensation forming on the indoor side of the case during the winter.

Sub-Base

The sub-base is an optional accessory for the Zoneline unit and is presented with the wall case information since the decision to use or not use a sub-base in the installation is a factor in the location of the wall opening for the unit. National Electrical Code® requires that air conditioning units connected to voltages in excess of 250 volts be "permanently connected." There are also some installations where units connected to voltage sources under 250 volts may also need to be "permanently connected." If you are in doubt about the requirements for a particular installation, consult Article 440 of the NEC or the local electrical inspector. These requirements are designed to protect personal safety and should be strictly followed. Although NEC is cited here as a reference, all electrical wiring and installations must conform to any and all local electrical codes and regulations.

"Permanent connection" generally means wiring to the unit must be contained in an enclosed "chaseway," where access to the wiring connections is more restrictive than a normal line cord plugged into a receptacle. NEC requirements may be met by using flexible or rigid conduit to contain the wiring between the unit and a junction box that contains the wiring connections. The conduit is connected to the unit and to the junction box with connectors to hold the conduit in place. The junction box may be located in the floor or the wall of the structure but only approved connectors may be used outside the unit or the junction box. The sub-base is UL® listed as a junction box for permanent connection of a Zoneline unit.

Using a sub-base in an installation requiring permanent connection provides a convenient, consistent location for unit wiring to be connected to building wiring. The use of a sub-base is not required, but the convenience and the improved aesthetics it offers makes the use of a sub-base a viable means of permanent connection.

RAK204U — The RAK204U Series of sub-bases provides a variety of designs that fit the site needs and are available for use with Zoneline PTAC/PTHP units. The RAK204U will most likely be used for support of the wall case and unit. The RAK204U is the same physically as the other sub-bases except there is no receptacle installed. Receptacles and wiring can be field installed and, by using the RAK205CW chaseway and the RAK4002A junction box perform the same function as any of the other sub-base kits by selecting the correct receptacle and installing it in the interior mounting plate inside the RAK204U.

208/230-volt receptacles can also be mounted in the cover plate for easy access when direct connect wiring is not required. 265-volt units are to be "Permanently (or Direct) Connected" and the external receptacle (when wiring is not enclosed in a chaseway) does not meet this requirement. A knockout for a fuseholder or a disconnect is also provided in the cover plate.

RAK204U — No receptacle, no wiring; will accept any 15-, 20-, 30-amp receptacle and wiring. No chaseway is included. RAK205CW chaseway must be ordered separately.

The 230/208-volt sub-bases below include a short, sub-base power connection kit. Since sub-base connected units are not considered to be line-cord connected, a Leakage Current Detection and Interruption or Arc Fault Current Interrupter device is not necessary.

The junction box (RAK4002A for 4100 and 6100 Series units) that mounts on the chassis of 230/208-volt sub-base connected units must be purchased separately.

RAK204D15P 208/230-volt 15-amp receptacle. Receptacle is NEMA6-20R with 18" of #12AWG wires attached to the receptacle. Short power connection kit included. Chaseway included.

RAK204D20P 208/230-volt 20-amp receptacle. Receptacle is NEMA6-20R with 18" of #12AWG wires attached to the receptacle. Short power connection kit included. Chaseway included.

Sub-Base (Continued)

RAK204D30P 208/230 volt 30-amp receptacle. Receptacle is NEMA6-30R with 18" of #12AWG wires attached to the receptacle. Short power connection kit included. Chaseway included.

The junction box (RAK4002A for 4100 and 6100 Series units) that mounts on the chassis of 230/208 volt sub-base connected units must be purchased separately.

Sub-bases for the 265-volt units:

RAK204E15 265-volt 15-amp receptacle. Receptacle is NEMA7-15R with 18" of #12AWG wires attached to the receptacle. Chaseway included.

RAK204E20 265-volt 20-amp receptacle. Receptacle is NEMA7-20R with 18" of #12AWG wires attached to the receptacle. Chaseway included.

RAK204E30 265-volt 30-amp receptacle. Receptacle is NEMA7-30R with 18" of #12AWG wires attached to the receptacle. Chaseway included.

The junction box for 265-volt units is shipped with the chassis since all 265-volt units are to be "permanently (or direct) connected."

The power connection kit is not included

There are separate internal compartments to permit separation of low-voltage (Class 2) connections from line-voltage connections as required by NEC. Conduit containing building wiring enters the sub-base through knockouts located in the rear or bottom of the sub-base and is not accessible when the wall case is installed.

The sub-base attaches to the RAB71 wall case with two clips (field-assembled) that are screwed into pre-drilled holes in the bottom front flange of the wall case. It attaches to the RAB77 wall case with clips that fit over molded ribs without requiring the use of screws into the wall case. See page 33 for illustration. Since the sub-base extends under the wall case, clearance from the inner edge of the wall case to the finished wall must be 2-3/8" or greater. The sub-base has four leveling legs and adjustable side channels to enable the area under the wall case to be enclosed. Clearance from the bottom edge of the wall case to the finished floor must be between 3" and 5".

The sub-base may be used as support for the chassis and wall case in installations where the wall is of insufficient thickness to provide secure mounting of the wall case.

Wall Case Installation Data

General

Generally, Zoneline units are installed 3" to 5" above the floor (flush to finished floor installation is possible) as near to the center of the room as possible; underneath a window or a glass panel is typical. Normal installation of the wall case allows installation flexibility; from flush with the finished interior wall to a minimum of 1/4" of the wall case extending beyond the finished exterior of the building. Special consideration must be given to installations where the wall case does not extend a minimum of 1/4" beyond the finished exterior wall. See pages 30 and 31 for information on this type of installation. The unit may be installed high in the wall and these installations usually require a remote thermostat and are discussed on pages 15 and 16.

Regardless of the installation, there are several things to consider when selecting a location for installing the unit. For instance, drapery location could interfere with air discharge, and placement of furniture may have an impact on the performance of the unit. The following information is intended to minimize installation problems and assure you of trouble-free installation.

Refer to page 21 for required wall opening dimensions. Minimum recommended interior and exterior case projections for standard wall thicknesses are shown in the drawings in this manual. The case may be installed flush with the finished indoor wall. Special attention must be paid to room-side case projection when the unit is installed in a ducted application as shown on pages 38 and 39.

In walls thicker than 13-1/2" for line-cord-connected units and 11-1/8" for sub-base installations, it may be necessary to install a field-fabricated case extension or use one of the special- order RAB71 deep wall cases. Such extensions must be carefully flashed and sealed both to the wall case and to the wall to ensure water integrity. This is necessary to ensure that any water entering the wall case, either from operation of the unit or from other sources, such as rain storms or from washing the exterior of the building, will drain from the case without the possibility of capillary action drawing the water into either the room or the wall cavity. In an installation where the case is recessed less than 3" from the outside surface, flashing and sealing may be all the modification necessary. In such an installation, the sides and top of the wall opening must be waterproof to prevent moisture from seeping into and damaging the walls. See pages 30 and 31 for suggested detail. Since the installation of a case extension requires a considerable amount of attention, we recommend using one of the deep wall cases if the standard case is not of sufficient depth.

Mounting an outdoor grille or louver section to the building face may cause a space between the outdoor coil and the louver section. Air splitters, aligned with the ends of the outdoor coil, must be installed between the outdoor coil inlet and outlet air streams. Gaps between the outdoor coil and the louver section may allow condenser air recirculation and affect the operation of the unit. See page 41 for requirements for custom louvers.

The wall case should be level from side to side and from level to 1/4 bubble tilt to the outdoors. The condensate disposal system in the unit is designed to dissipate the condensate water generated during cooling operation in accordance with ARI standards and actually uses this water for maximum unit efficiency. A level unit will also ensure proper performance of the Internal Condensate Removal (ICR) system optional on heat pump units.

Wall Case Installation Data (Continued)

For new construction, early planning with the architect is necessary. Unit location, electrical connection locations and wall openings of the proper dimensions are essential to avoid the necessity of rework, fillers, framing, moving electrical outlets and other expensive modifications.

For existing construction it is important that carpentry, masonry and electrical work be performed by competent, qualified personnel. Since installations in existing construction may involve removal of building material from the structure, locating the wall case must be done correctly.

Architectural Window/ Louver Installation

Many installations utilize an architectural window/louver combination to enhance the exterior appearance of the building. The exterior grille for the air conditioner is built as an integral part of the window frame. An internal drain system is highly recommended for these installations (see page 36). When this type of installation is made, there must be provision in the grille work for condensate water to drain to the exterior (including the overflow relief drain holes) and not be routed back into the interior of the building or into the wall cavity. Failure to allow for the drainage of condensate water can cause extensive damage to structural components. The problems associated with the lack of condensate drain consideration often show up shortly after the air conditioners are turned on in a new building. New buildings that have been virtually wide-open during construction have a significant amount of moisture in the air and in the building components that the air conditioners start removing as they operate. The free area in the louver section must also comply with the requirements shown on page 41.

The wall case should be anchored to the architectural window/louver section to reduce air infiltration and excessive vibration of the chassis and wall case during unit operation. Field-fabricated and installed case angles are the recommended method of securing the wall case to the window/louver framework.

Window, Curtain and Panel Wall Construction

With this type of construction, provision for support of the unit, other than by the wall itself, is often required. Such support may be in the form of wood or metallic material of the proper thickness to maintain a level case. This additional support should be located both near the wall and at the front of the wall case. Sub-base (RAK204 Series) with four leveling legs provides an excellent support for the unit in this type of installation. See page 28 for details of this type of installation.

In existing construction, common practice is to remove a pane of glass, metal, wood, or other construction material and build a frame around the wall case. Similar filler panel material may be installed around the case for appearance and weather seal.

Masonry Wall Construction

The wall case should be installed during construction and lintels should be used to support the blocks above the wall case. The wall case will not support the concrete block. The installation instructions show how the wall case must be secured to the masonry and caulked. Do not remove the cardboard stiffener supplied with the wall case until ready to install the chassis. See page 29 for details of installation in masonry wall.

For existing masonry construction, wall openings must be made by removing concrete blocks to achieve the proper-size opening. Consult the builder, architect or owner to determine the necessity for lintels to support the block above the wall case.

Anchor bolts are normally required to secure the case to the wall and shims may be required to prevent distortion of the wall case when securing the wall case to the wall. Field-supplied case angles can be used to position and secure the wall case to the wall and to cover oversized wall openings.

Brick, Frame, Stucco and Shingle Construction

For new construction, the opening for the wall case should be framed and the wall case inserted into the opening during construction. Lintels should be used when the building material is heavy and is not self-supporting (such as brick). The wall case will fit an opening of six courses of standard brick or five courses of jumbo brick. Wall framing in this type construction is normally on 16" centers and the wall case will fit a framed opening spanning three 16" O.C. 2" x 4" stud spaces.

For existing construction, the indoor and outdoor wall will need to be cut out, allowing for clearances of 1/8" on all sides of the wall case. Work should begin on the inside wall. Cut the correct dimensions and mark (using drill holes) the outside wall from each corner of the inside cutout. Studding that interferes with the opening must be removed and a suitable frame constructed to secure the wall case and provide adequate support for case and chassis.

As shipped, the RAB71A Series or RAB77 is ready for installation.

Preparation of the Wall Case for All Types of Construction,

Do not remove the stiffener from inside the wall case or the weather closure panel from the outside face of the wall case until the outdoor grille and chassis are ready to be installed.

Installation of Wall Case in Wall Opening

1. Position the wall case into the wall. The room-side edge of the RAB71A or RAB77 wall case should be at least flush with the finished wall for line-cord installations and permanent- connection installations when no sub-base is used, and should project into the room at least 2-3/8" when a sub-base is used. The outside edge of the wall case should extend at least 1/4" beyond the outside wall. This is necessary for proper caulking, to prevent sealing the drain holes in the rear flange of the wall case, and to facilitate the installation of an accessory drain, if used. If the minimum exterior dimensions are not met, refer to pages 30 and 31.

   The wall case should be level from side to side and from level to 1/4 bubble tilt to the outdoors. The condensate disposal system in the unit is designed to dissipate the condensate water generated during cooling operation in accordance with ARI standards and actually uses this water for maximum unit efficiency. A level unit will also ensure proper performance of the Internal Condensate Removal (ICR) system optional on heat pump units.

2. The wall case should be secured to the wall at both sides. Use a minimum of two screws or other fastening device on each side. See Figure 2 on page 26. Mark the wall case on each side 2" from the bottom and 2" from the top at a point where basic wall structure is located. Drill wall case and use fasteners appropriate for wall construction. All holes for fasteners in the side of the wall case must be at least 2" up from the bottom of the wall case. Never locate screws or put other holes in the bottom of the wall case. The ONLY exception is when an RAD10 drain kit is installed to connect to an internal drain system. See page 36 for RAD10 drain kit information.

   If the wall opening is greater than the case dimensions, spacers must be used on the sides between the wall case and the wall support structure to prevent distorting the wall case.

3. Caulk or gasket the entire opening on the outside between the wall case and exterior wall surface (four sides) to provide total water and air seal.
4. Caulk or gasket room-side opening between wall case and interior wall surface (four sides). Opening beneath or around the wall case can allow outdoor air to leak into the room, resulting in increased operating costs and improper room temperature control.

Care should be taken in location of electrical supply entry in relationship to wall sleeve to assure access to receptacle or junction box once unit is installed.

- **Refer to page 43 for maximum power cord length.**
- **Permanently connected units close to finished floor must allow for conduit clearance.**

Case Angles

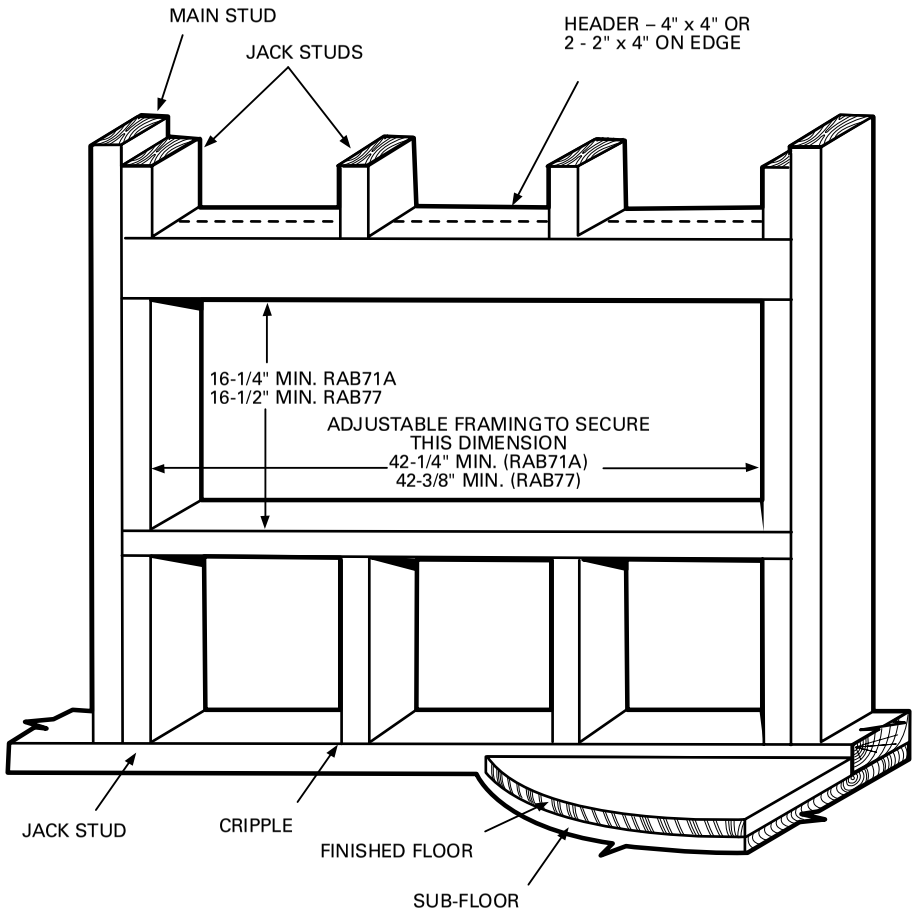
In some installations, such as curtain walls, window walls, or where the structural material of the wall is insufficient to support or fasten wall case, case angles may be used. Case angles are pieces of steel or other material of similar structural strength that are formed to a 90° angle, with holes to fasten the case angle to the wall case and to the structural component of the wall surrounding the wall case.

The following describes the procedure when ***field-fabricated and -installed*** case angles are applied.

1. Position case angles around top and sides of wall case at the desired location. Position case angles vertically on each side of wall case to provide a level installation.
2. Mark wall case through holes in case angles. The lowest hole on the sides of the wall case must be a minimum of 2" above the bottom of the case.
3. For **RAB71A** wall case, drill 5/32" diameter holes at locations marked on wall case in Step 2, and assemble angles to wall case using #10 x 1/2" self-tapping screws. For **RAB77** wall case, follow the same procedure except use a #10 x 1/2" bolt, washer and nut to attach case angles to case. Install screws or bolts from inside wall case.
4. Do not drill any holes in bottom of wall case. Do not distort wall case.
5. Do not use case angles for a lintel.

FRAMING FOR WALL CASE

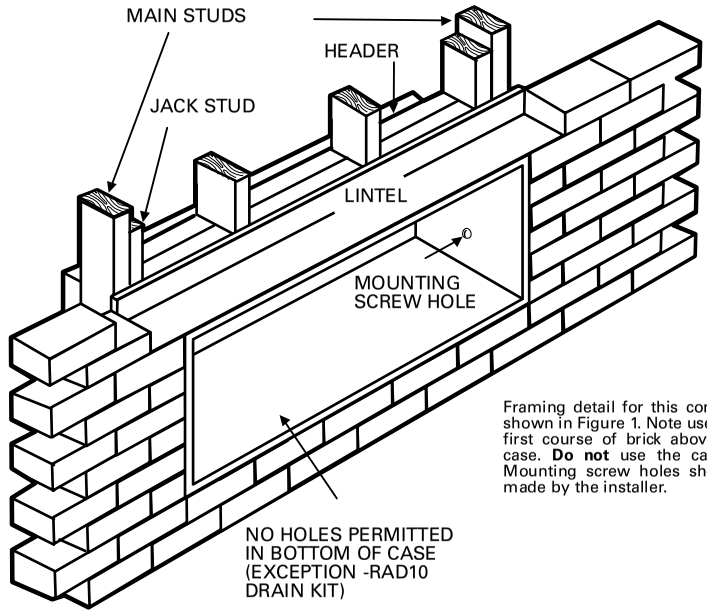
Brick Veneer and Frame Construction



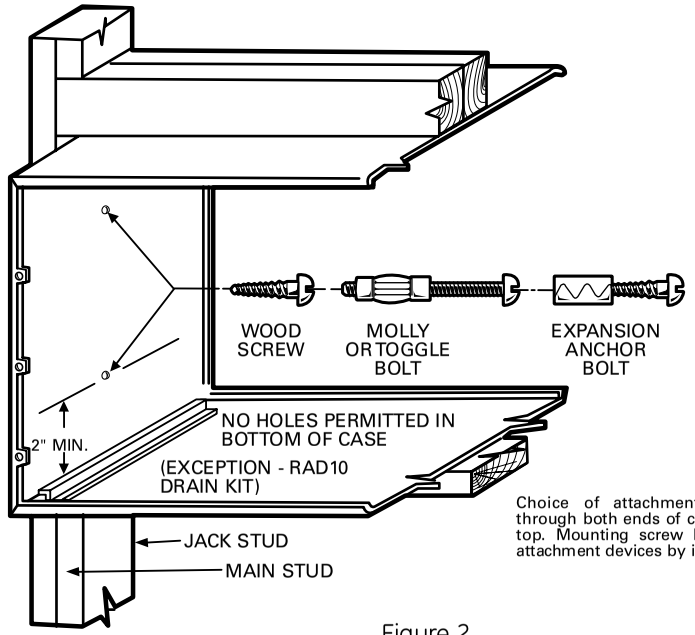
Note: Do not remove the stiffener support from inside the wall case until the chassis is to be installed.

Figure 1

FASTENING WALL CASE



Framing detail for this construction is as shown in Figure 1. Note use of lintel under first course of brick above the Zoneline case. **Do not** use the case as a lintel. Mounting screw holes shown are to be made by the installer.



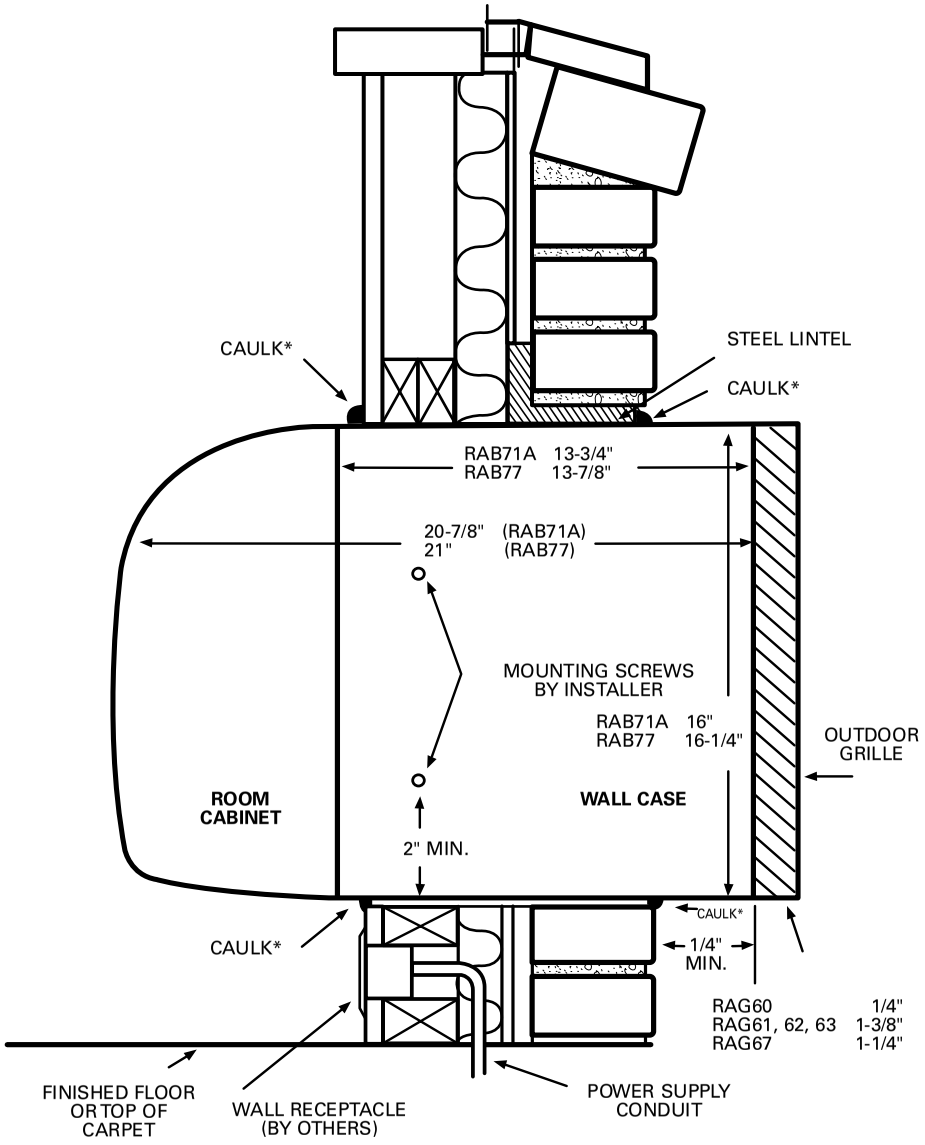
Choice of attachment devices through both ends of case or the top. Mounting screw holes and attachment devices by installer.

Figure 2

WALL SECTION – DETAILED SIDE VIEW

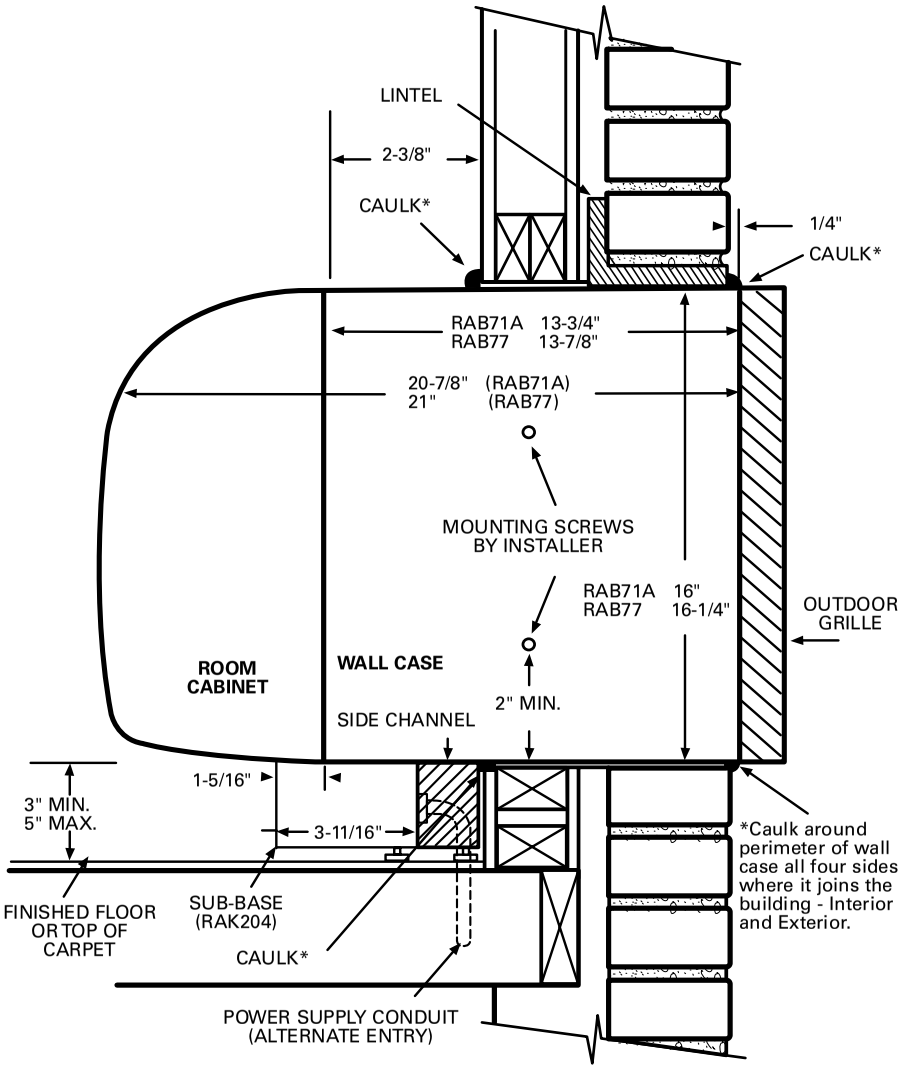
Frame and Brick Veneer Installation

Cord set connected



*Caulk around perimeter of wall case all four sides where it joins the building - Interior and Exterior.

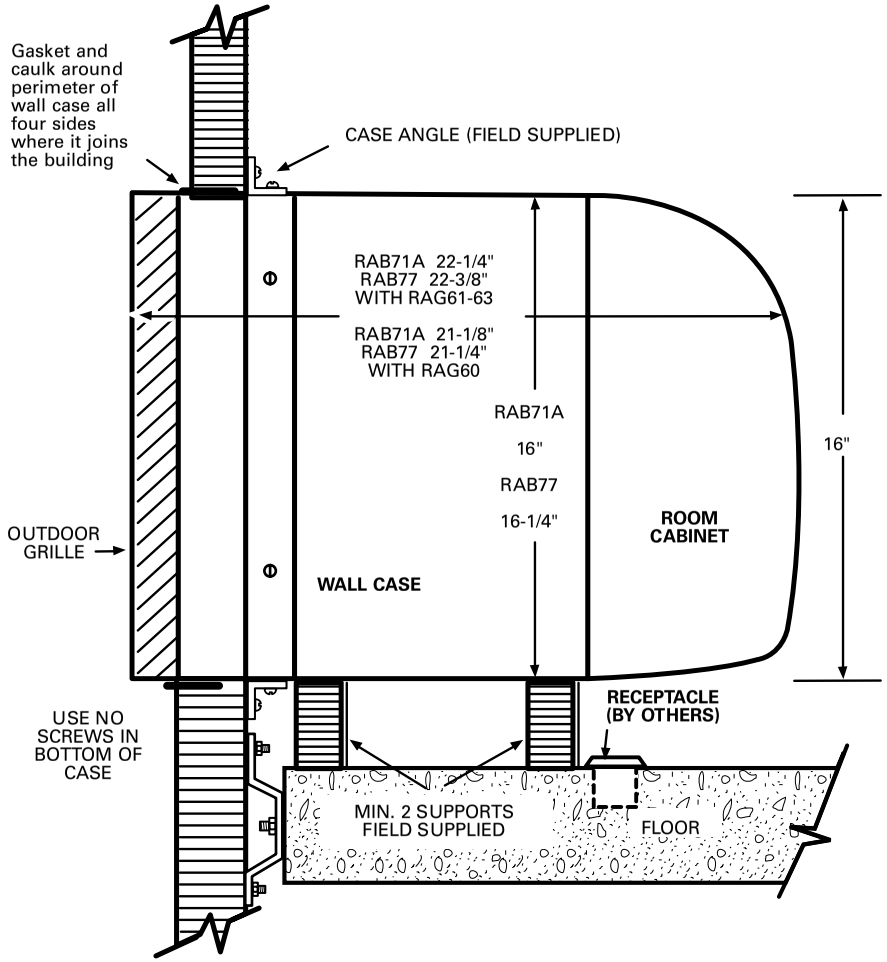
Sub-Base Connected



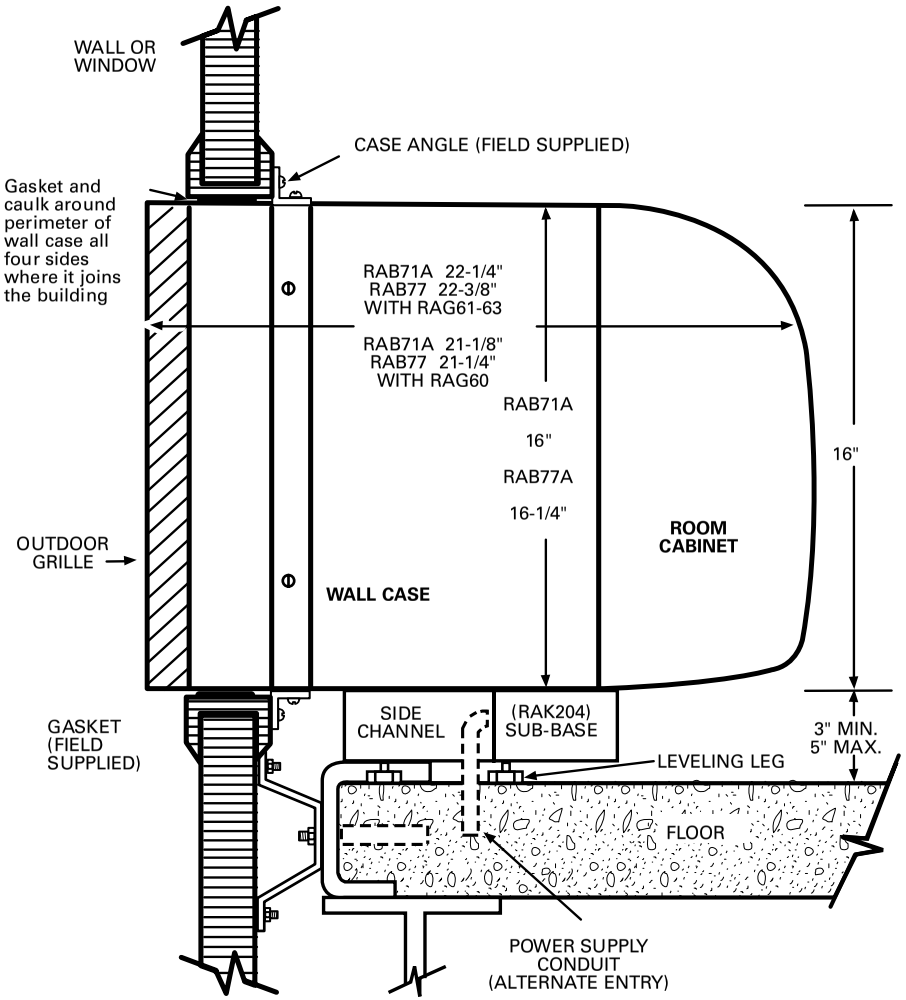
WALL SECTION – DETAILED SIDE VIEW

Window, 2" curtain or panel wall installation with rag rear grille extended beyond outer wall surface

Cord Set Connected

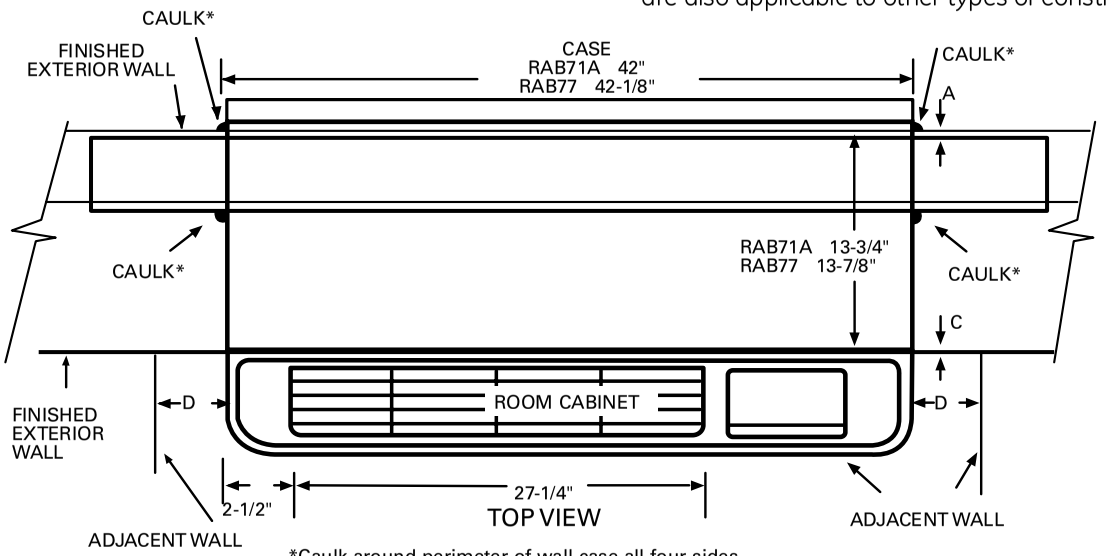


Sub-Base Connected



WALL CASE INSTALLATION – CORD SET CONNECTED

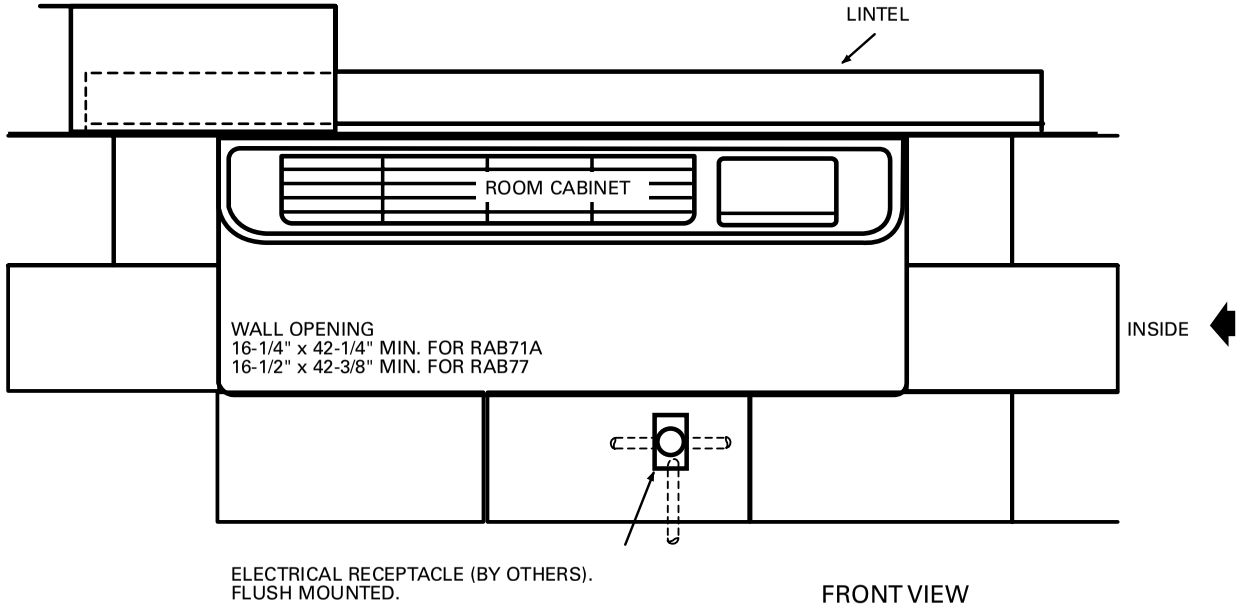
Example: block and veneer – dimensional data and comments are also applicable to other types of construction

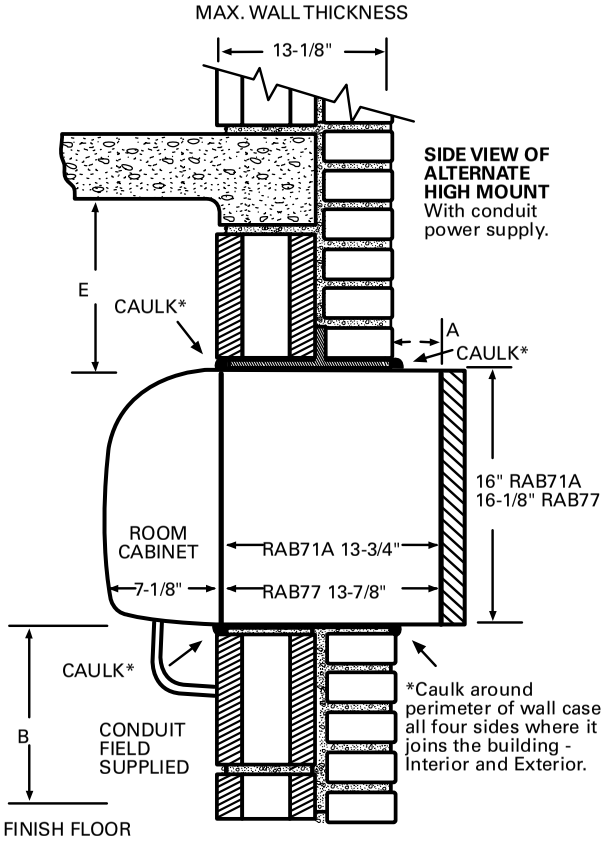


*Caulk around perimeter of wall case all four sides where it joins the building - Interior and Exterior.

Dimension	Manufacturer Required Minimum Installation Clearance
A	1/4" (See note 1)
B	Allow For Electrical Wiring 0" Min. (See page 27)
C	0" Minimum
D	0" Minimum 2" Recommended See pages 38-39 for ducted application.
E	3" Minimum

NOTE:
1. FOR OUTSIDE FLUSH MOUNTING SEE PAGE 35 FOR DRAIN INSTALLATION.





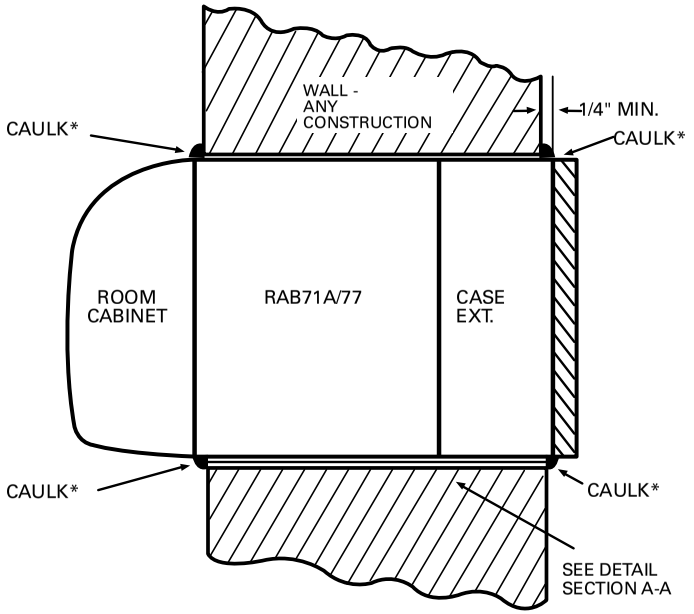
See page 43 for line cord length.

METAL CASE EXTENSION FOR WALLS DEEPER THAN 13-1/8" (11-1/8" WITH SUB-BASE)

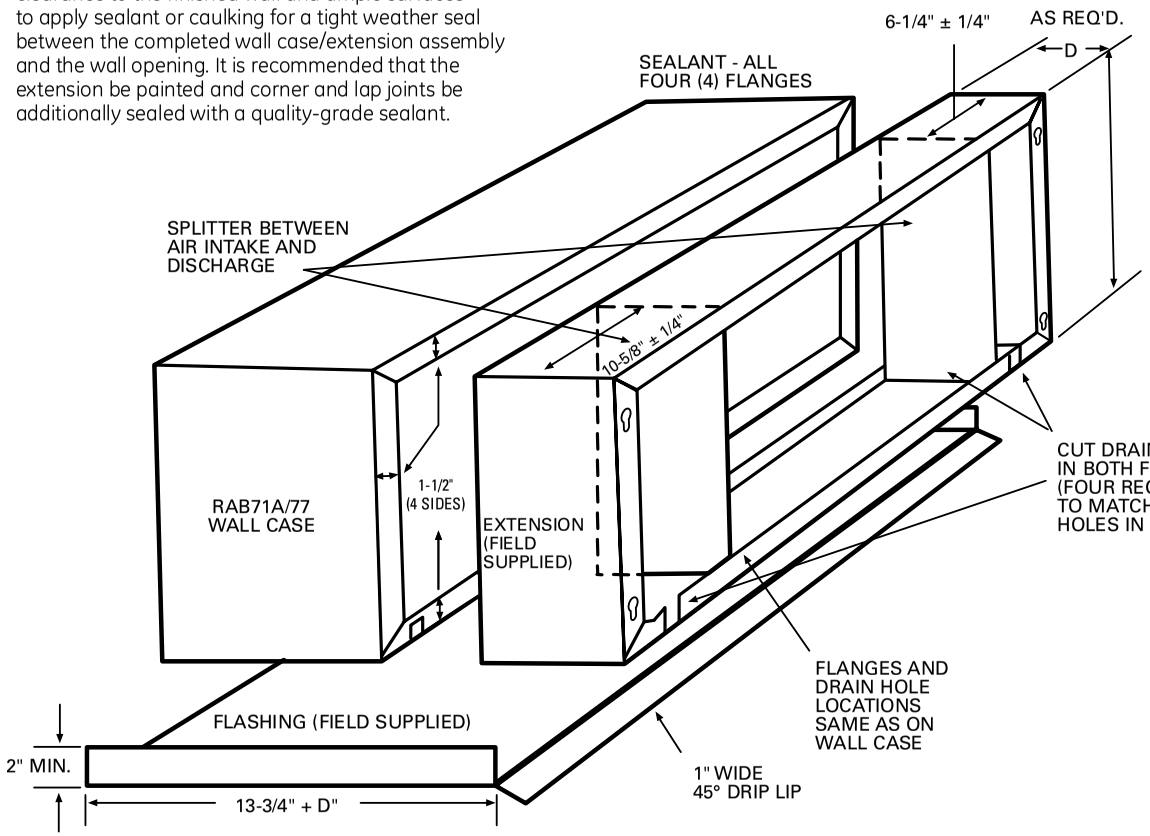
Field fabricated – ge recommends the use of one of the deeper RAB71 wall cases offered as special order items.

Zoneline units can be installed in walls of greater depth than the wall case. Where the case recession is less than 3" and where it is possible to waterproof the exposed sides and top of the opening, the suggested procedure is to apply a flashing to the bottom of the wall case as shown on page 31. Where waterproofing is questionable or not possible, or for installations in walls of greater depth, the following is a suggested application procedure. It involves the field fabrication of a case extension. **Since the wall case is a water-bearing container, the extension likewise must also be water-bearing and the connection between the two must be watertight. The case extension must contain splitters to prevent recirculation of the outdoor air circuit.**

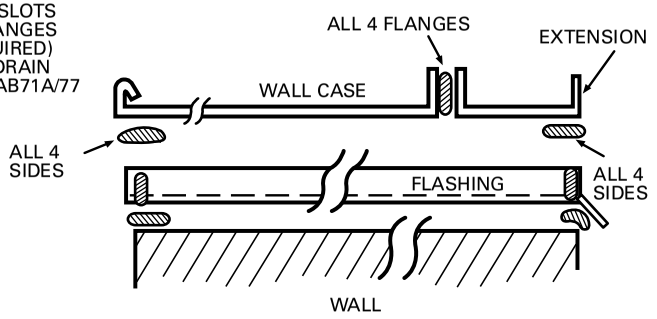
1. The case extension is field fabricated. The extension depth "D" should allow for a minimum outdoor projection of 1/4". This allows for room cabinet clearance to the finished wall and ample surfaces to apply sealant or caulking for a tight weather seal between the completed wall case/extension assembly and the wall opening. It is recommended that the extension be painted and corner and lap joints be additionally sealed with a quality-grade sealant.
2. The wall case and extension should be connected prior to installation in the wall opening. A quality-grade sealant should be applied to all four (4) butting flanges. Use bolts and nuts or oversized self-tapping screws (driven from the wall case to the extension) to attach the two assemblies. Clean all drain holes of excess sealant. The assembly must be free draining.
3. Install flashing, using a quality-grade sealant between the flashing and wall as shown in section A-A below.
4. Install the wall case/extension assembly following procedures described for a standard installation. See diagrams below. The assembly should be sealed or caulked to the wall around all four sides both outdoors and indoors.
   NOTE: The wall case/extension assembly should be level.
5. Suggested materials for case extension and flashing should be non-ferrous metals. Minimal acceptable material: Galvanized G-90 painted.



*Caulk around perimeter of wall case all four sides where it joins the building - Interior and Exterior.

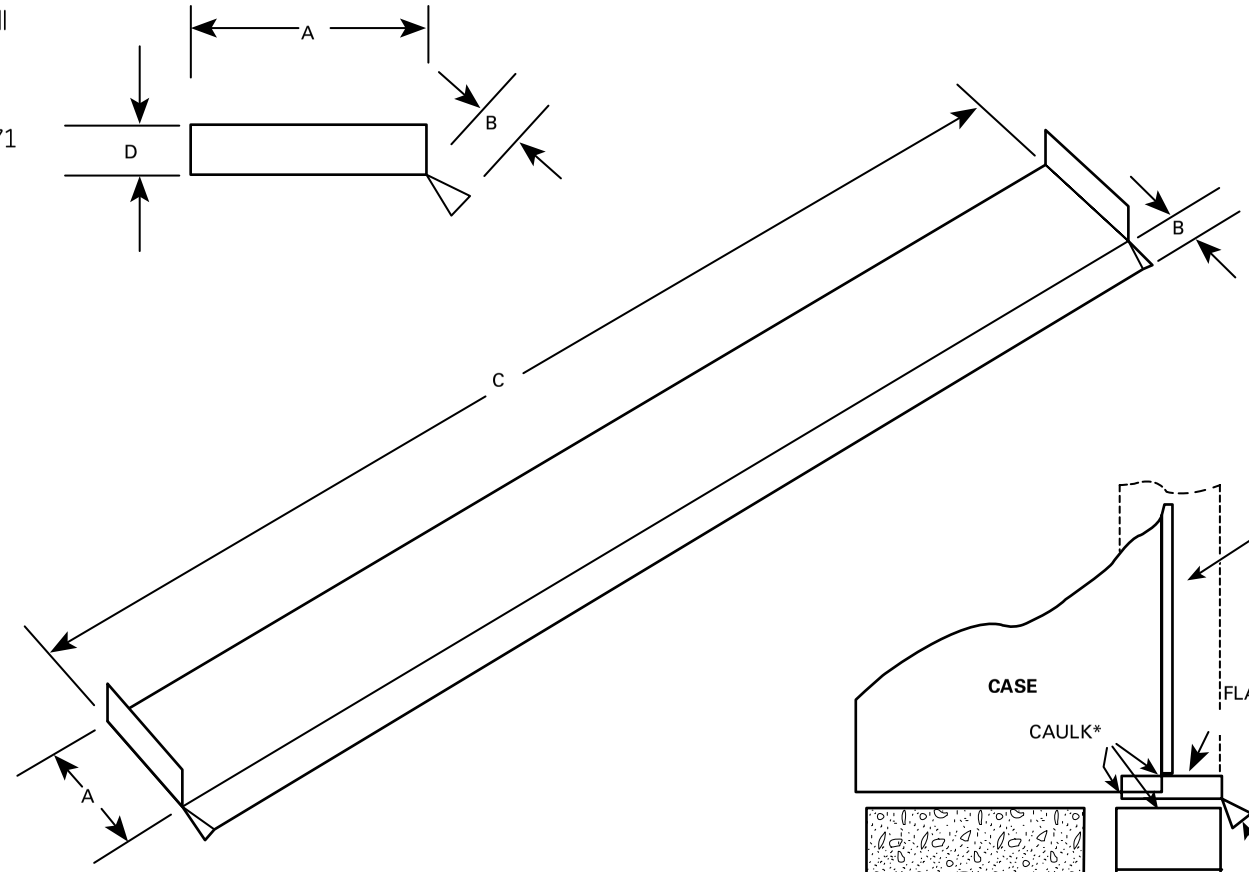


SECTION A-A
BASEPAN/FLANGE DESIGN
SHOWING SEALANT LOCATIONS.



ALTERNATE – CASE RECESSION LESS THAN 3" WITH SIDES AND TOP OF WALL OPENING WATERPROOF, FLASHING ON BOTTOM ONLY

For an installation that will provide better protection against water infiltration, GE recommends the use of one of the deeper RAB71 Series wall cases offered as special-order items. See page 21.



*Caulk around perimeter of wall case all four sides where it joins the building - Interior and Exterior.

DIMENSIONS:

A. DISTANCE FROM GRILLE OR CASE TO OUTSIDE SURFACE OF WALL PLUS 2" TO 4" (TO INSERT UNDER CASE).

B. 1" DRIP LIP (MINIMUM)

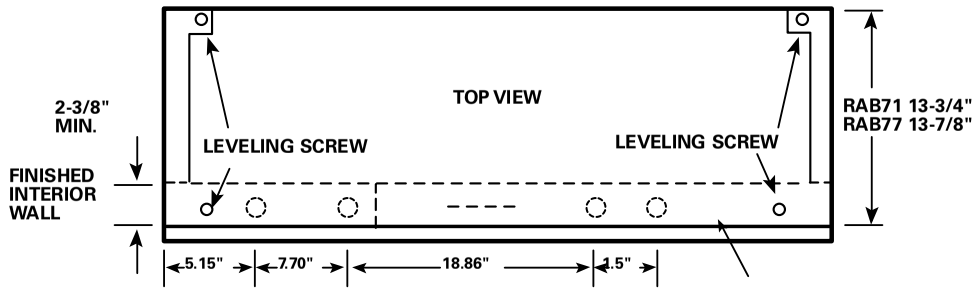
C. 42" PLUS - SUFFICIENT TO FIT SNUGGLY UNDER AND UP AROUND THE CASE.

D. 2" MINIMUM

(CAUTION: WHEN CAULKING **DO NOT BLOCK DRAIN HOLES IN CASE OR GRILLE.**)
IF GRILLE IS TO BE MOUNTED TO WALL SURFACE A SPLITTERS MUST BE USED, SEE PAGE 30.

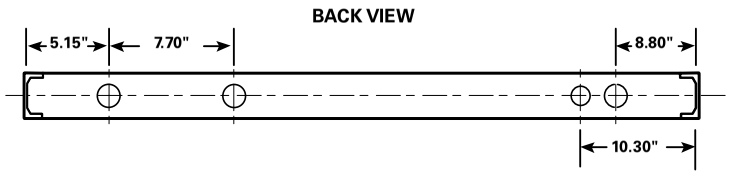
RAB71/77 WALL CASE INSTALLATION - RAK204 SERIES SUB-BASE CONNECTED

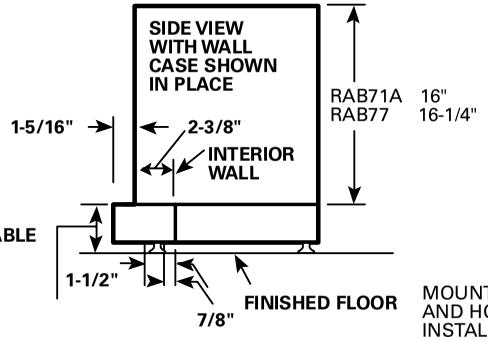
Example: frame and brick veneer - dimensional data and comments
are also applicable to other types of construction

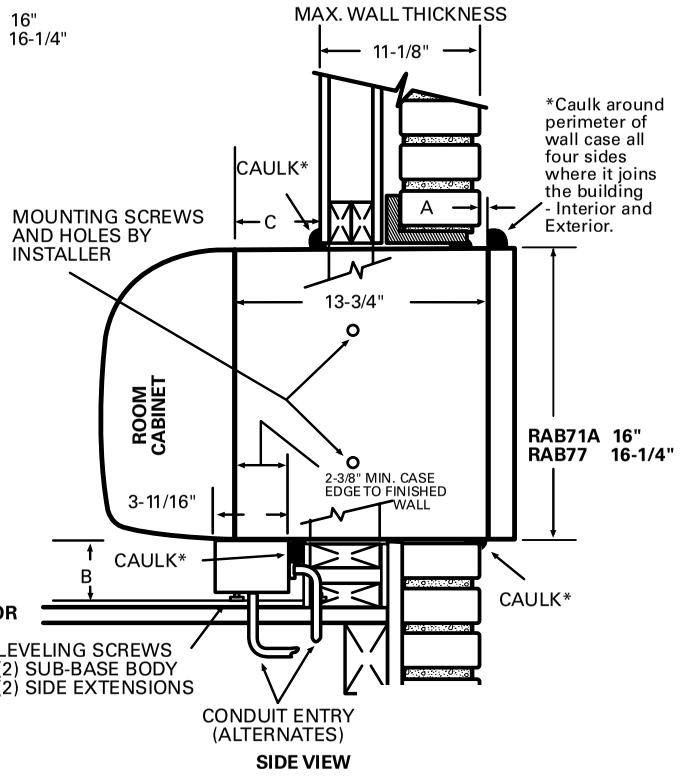


Dimension	Manufacturer Required Minimum Installation Clearance
A	1/4" (See note 1)
B	3" Min. (5" MAX.)
C	2-3/8" Minimum
D	0" Minimum 2" Recommended See pages 38-39 for ducted application.

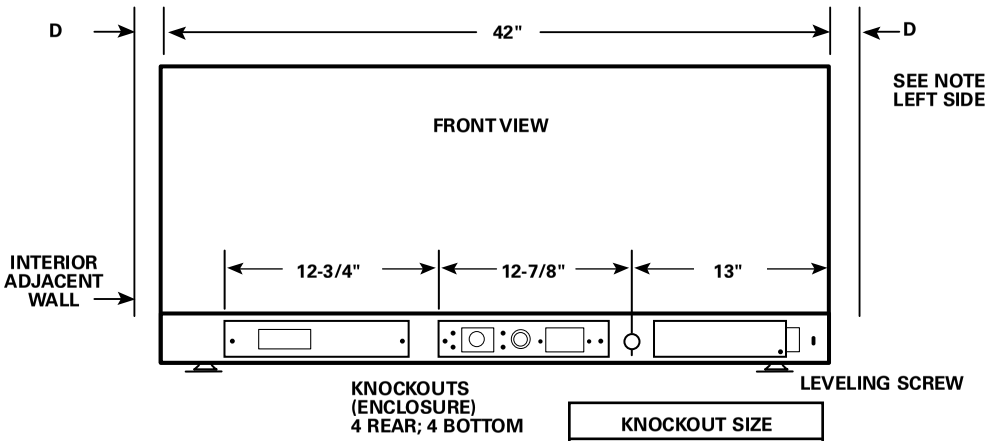
NOTE:
1. FOR OUTSIDE FLUSH MOUNTING SEE PAGE 31 FOR FLASHING INSTALLATION.







RECOMMEND 2" TO INTERIOR ADJACENT WALL BOTH SIDES.

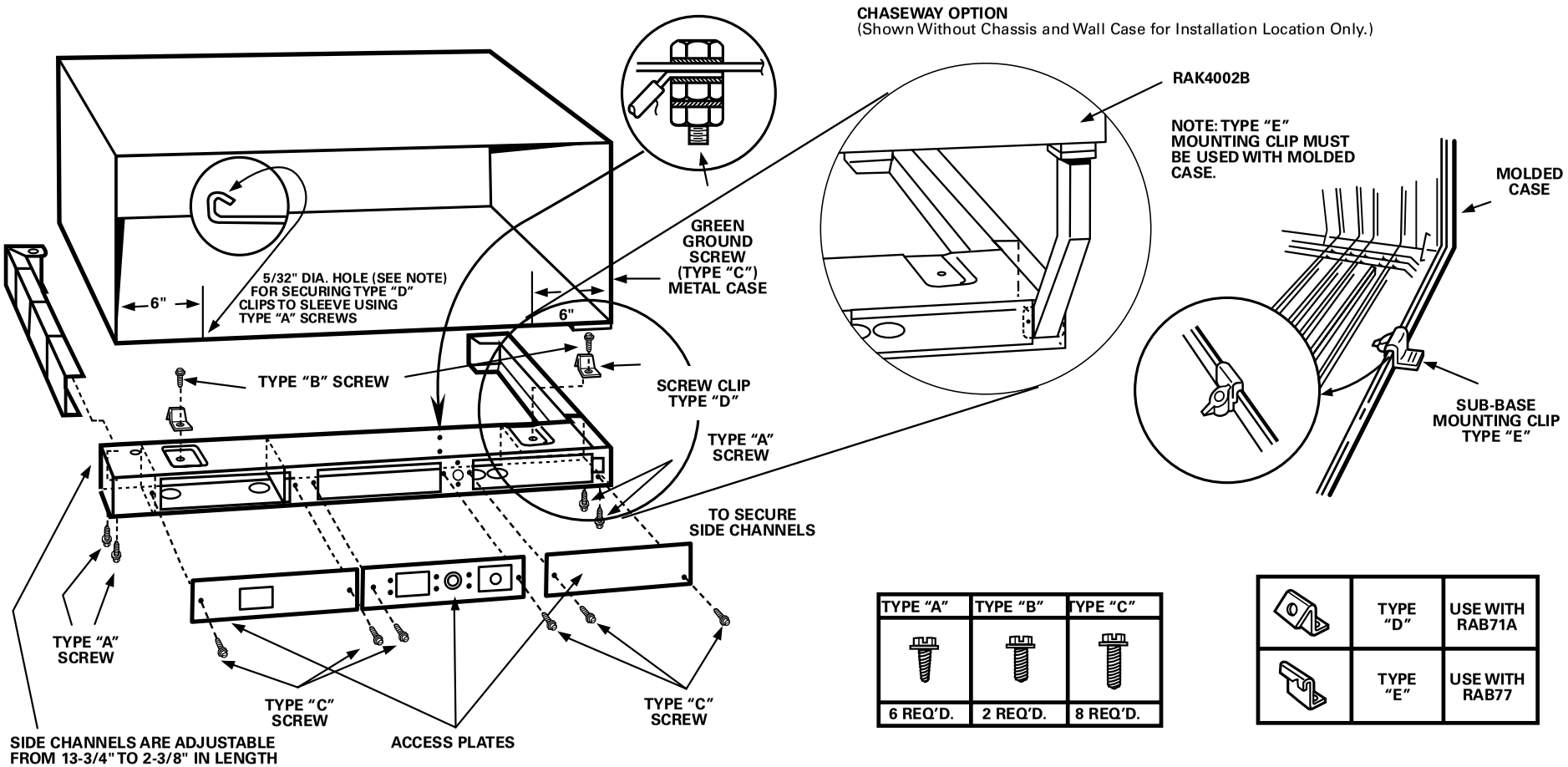


KNOCKOUT SIZE
LARGE 1-1/8" DIA.
SMALL 7/8" DIA.

*SHOWN WITH ACCESS COVERS REMOVED.
NOTE: CAUTION - REMOVE KNOCKOUTS FROM INSIDE OUT.

RAK204 SERIES SUB-BASE INSTALLATION AND ELECTRICAL DATA

RAB71A/77 Wall Case



TYPE "A"	TYPE "B"	TYPE "C"
6 REQ'D.	2 REQ'D.	8 REQ'D.

	TYPE "D"	USE WITH RAB71A
	TYPE "E"	USE WITH RAB77

Electrical wiring may enter the sub-base through any of the knockout holes provided in the sub-base.
Knockout holes in the sub-base access plate may accommodate a receptacle, which allows the use of a power cord (if permitted by code for the particular installation).
A knockout for a circuit breaker, fuseholder or a disconnect is also provided. See pages 22 and 23 for description of electrical contents of these sub-bases.

Condensate Disposal Systems

Cooling Condensate

Air conditioners produce condensate water as a result of lowering the humidity of the area being conditioned. When the indoor coil temperature is below the dew point, moisture in the air condenses into water droplets on the coil. This water drains to a pan located under the indoor coil and is routed through the barrier (the partition separating the indoor and outdoor sides of the unit) to the base pan on the outdoor side. It is then picked up and dispersed against the outdoor coil, which is hot when the unit is in the air conditioning mode. The water is evaporated into the atmosphere by contact with the hot outdoor coil. This evaporation process also helps lower the temperature of the outdoor coil and improves the operating efficiency of the unit.

Slinger Ring Systems

Packaged terminal units employ various means of dispersing the condensate water. One of the most popular, and most effective, means is by the use of a "slinger ring." A slinger ring is a ring around the circumference of the outdoor fan. The design of the unit positions the slinger ring very close to the bottom of the base pan so water in the base pan is lifted by the rotating ring. Water picked up by the slinger ring will be dispersed into the air stream and deposited on the hot outdoor coil where it evaporates.

All Zoneline® Series packaged terminal air conditioners and packaged terminal heat pumps utilize a slinger ring for cooling condensate disposal.

Certification Test Requirements

ARI (Air Conditioning & Refrigerating Institute) requires that all certified packaged terminal air conditioners and packaged terminal heat pumps pass a cooling condensate disposal test. One stipulation of the ARI test is that "the test start with condensate collection pan brimful." In order to pass the ARI Condensate Disposal Test the unit must operate continuously for four hours without condensed water blowing, dripping, or running off the unit casing during the test or after the unit has been turned off. Under extremely high outdoor humidity conditions or extreme operating conditions, such as exceptionally high air infiltration (a door or window left open while the unit is running, for instance) it is possible for any air conditioner to be unable to dissipate all the cooling condensate generated.

All Zoneline Series packaged terminal air conditioners and packaged terminal heat pumps meet the condensate disposal requirements of ARI standards 310 and 380.

Heat Pump Condensate

During the operation of a unit in the heat pump, or "reverse cycle," mode the outdoor coil becomes the cold coil and the indoor coil becomes the hot coil due to reversing the flow of the refrigerant. When the temperature of the outdoor coil is below the dew point, condensation will form on the outdoor coil just as it does on the indoor coil during cooling operation. Since the dew point is humidity- as well as temperature-related, there may be more condensate on days when the relative humidity is high.

Heat Pump Condensate Disposal

Since the outdoor coil is cold during heat pump operation, the condensate water cannot be deposited on the outdoor coil as the water would cause frost to form on the coil. This frost would block the airflow through the coil and greatly reduce the outdoor air. Rather than allow this problem to occur, heat pump units must dispose of the condensate in another manner.

Temperature-Activated Drain Valve

The most widely used method of disposing of heat pump condensate is with a temperature-activated drain valve. This is a device mounted in the base pan of a heat pump unit with a bellows that expands on temperature rise and contracts with temperature drop. A shaft with a rubber plug on the end is connected to the bellows. When the outdoor temperature remains above a certain temperature, the bellows is expanded and the plug fits tightly into a hole in the bottom, or base pan, of the unit. When the plug is blocking the hole, as it should be during cooling operation, the condensate water is contained in the base pan. At temperatures when heating is required, the bellows contracts, the rubber plug is retracted from the hole and the heat pump condensate water is allowed to drain into the wall case. The valve is fully open at approximately 45°F.

Drain Kits

Although the Zoneline units are designed to dissipate most of the condensate generated during normal cooling operation, there may be times when abnormal operating conditions cause more condensate than the unit can dissipate. Heat pumps also generate condensate that the unit may not be designed to dissipate. For these reasons, if condensate dripping from the wall case is objectionable, an internal or external drain system should be installed. See pages 35 and 36 for information covering the drain systems and the RAD10 kit available to connect to the wall case.

Internal Condensate Removal (ICR) System

GE has developed an Internal Condensate Removal (ICR) system for packaged terminal heat pumps. This system has been offered as an option on Zoneline packaged terminal Heat Pumps since 1982, and thousands of them are in use. During heat pump operation the ICR system utilizes a small pump to lift the water from the base pan and pump it into a collector tray positioned above the indoor coil. The water drains from the collector tray and drips onto the warm indoor coil where it is evaporated into the room atmosphere. If an excess amount of water is pumped to the indoor side, it is routed back to the outdoor portion of the base pan.

The ICR system has proven to be an effective means of minimizing the amount of heat pump condensate dripping from the unit. However, if the restrictions of a particular installation will allow absolutely no drippage of condensate water from the wall case, the installation of an internal or external drain system is recommended.

Units with ICR may not be installed in seacoast or corrosive environment applications.

WALL CASE WITH RAD10 DRAIN KIT

External Drain. See page 36 for internal drain.

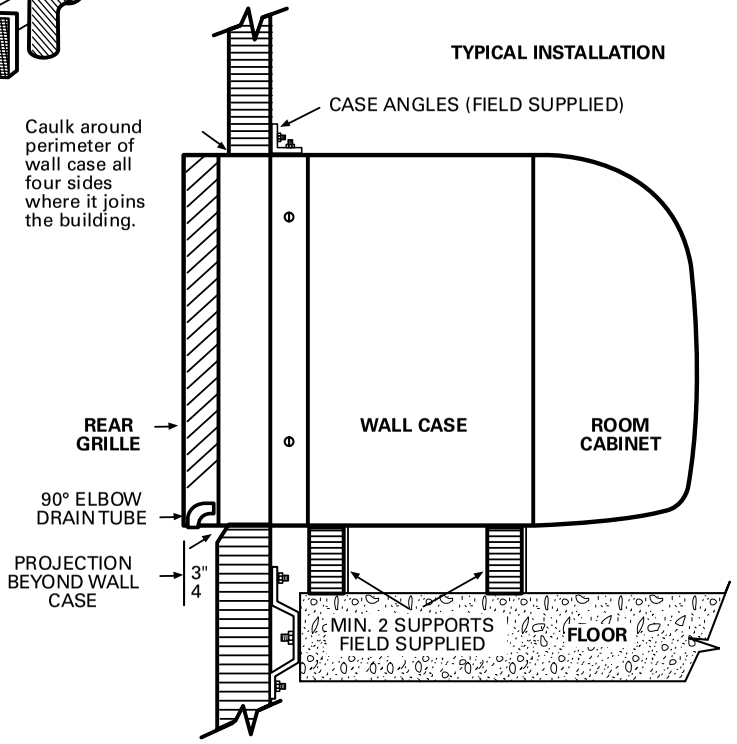
SCREWS

"A" METAL	"B" PLASTIC
	

NOTE: SHADED PARTS AND SCREWS ARE INCLUDED WITH RAD10 DRAIN KIT. USE EITHER THE 90° ELBOW TUBE OR THE STRAIGHT TUBE DEPENDING UPON THE REQUIREMENTS OF THE PARTICULAR INSTALLATION.

Alternate 6" long, 1/2" O.D. straight copper tube.

TYPICAL INSTALLATION



WATER DRAINAGE - Precipitation entering the unit through the outdoor louver may not be removed entirely by the condensate removal system. The base pan flange is designed to allow excess water, either condensate water or precipitation, to flow into the wall case and drain through two drain holes in the rear of the wall case. If there is more water in the wall case than can be drained through these holes it will drain through the three overflow drain holes. These drain holes must not be blocked when mounting or caulking the wall case.

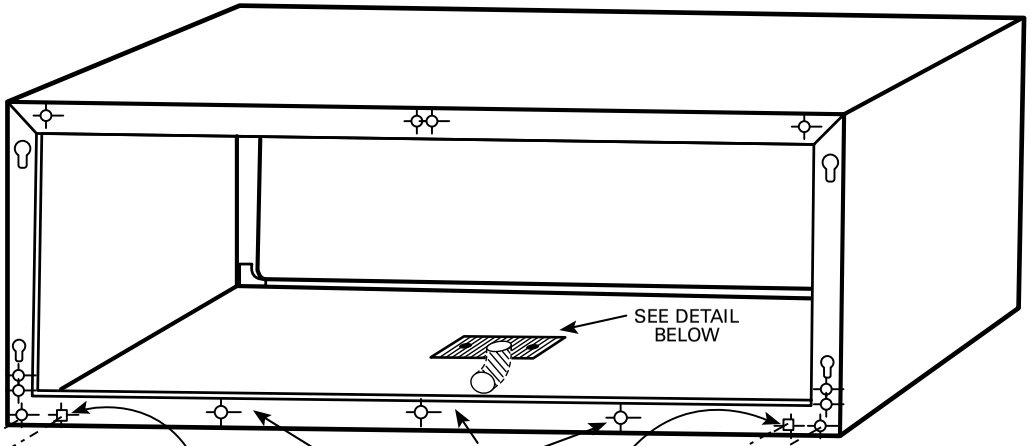
For those installations where water draining from the drain holes is objectionable or where positive drainage is desired, the RAD10 drain kit is available with either a 90° elbow or a 6" straight tube to be used either to connect to a field-supplied drain line or to allow the water to drip free rather than drain down the surface of the building.

NOTE: Drain kit using either the 90° elbow tube or the straight tube may be installed without modification when using RAG60 exterior grille. Drain kit using the 90° elbow tube may be installed without modification when using RAG61 through RAG63 exterior grilles. Modification must be made to the RAG61 through RAG63 exterior grilles when using the straight tube. Modification must be made to the RAG67 grille if using either the 90° elbow tube or the straight tube (see installation instructions with the RAG67 grille).

WALL CASE WITH RAD10 DRAIN KIT

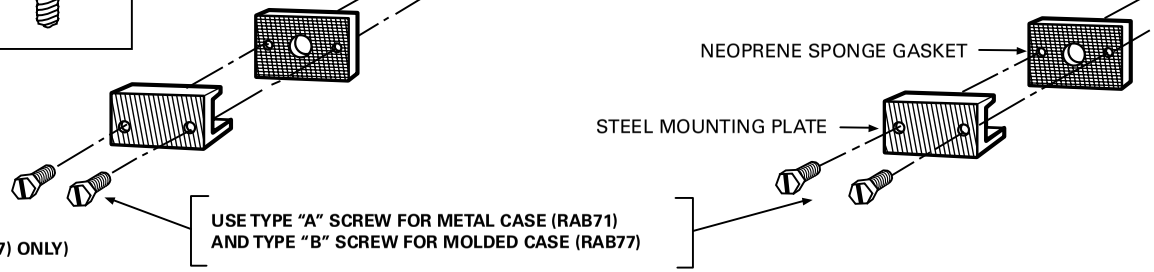
Internal Drain. See page 35 for external drain.

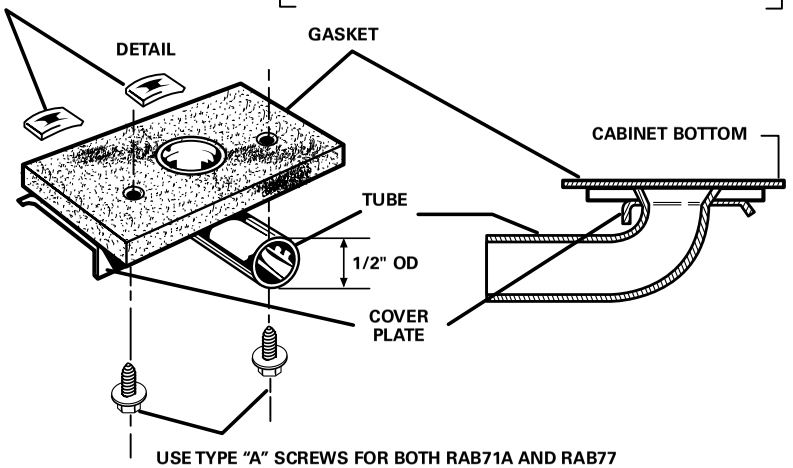
NOTE: SHADED PARTS AND SCREWS INCLUDED WITH RAD10 DRAIN KIT. THE 90° ELBOW TUBE IS RECOMMENDED FOR INTERNAL DRAIN INSTALLATION.



SCREWS

"A" METAL	"B" PLASTIC
	





1. The RAD10 drain kit is installed in the bottom of the wall case when it is desired to drain condensate to an internal drain system in the building.
2. The drain kit is mounted on the bottom of the wall case prior to installation of the case in the wall. It may be located anywhere on the room-side portion except for sub-base installations. For these the drain should be at least 3" from the indoor edge of the case so as to adequately clear the sub-base.
3. A template is furnished with the kit for locating the necessary three holes in the case bottom —two to provide a securing means and one to provide a drain hole for the 1/2" OD tubing (see details at left).
4. A tube or hose 1/2" I.D. (obtained locally) must be installed on the drain tube and connected to the internal drain system in the building.
5. With the RAD10 the two square drain holes in the bottom outer flange of the wall case are sealed by the gaskets and mounting plates shown above.
6. Three (3) 1/2" diameter holes located 1/4" above the case bottom in the bottom outer flange provide overflow drainage to the outdoors when wind-driven rain enters the chassis.

Ducted Installations

4100 and 6100 Series Zoneline® units may be used in ducted installations.

With a ducted installation it is possible to condition the air in two areas that have a common wall separating them. A special adapter mounts on the wall case and a transition piece directs the air from the unit into the adapter. Instructions for mounting the adapter to the wall case are included with the duct adapter. The adapter contains a grille that allows air from the unit to be discharged into the primary room and the adapter connects to a duct extension that allows the air to flow to the adjoining room. Ducting a unit may allow a single unit to be used rather than a separate unit in each room, providing a means of reducing initial equipment cost. The duct may extend a total of 15 feet (with a field-fabricated insulated duct extension) in one direction, either to the right or to the left of the unit. A baffle in the adapter allows up to 50% of the discharge air to be delivered to the secondary room.

The installation of the wall case and sub-base, if used, is the same for units being ducted as for free-standing units. The duct adapter support bracket overlaps the wall case by 1" and the bracket and mounting screws add approximately 3/8" (3/16" on each side) to the width of the wall case. If less than 1" of the wall case projects into the room it will be necessary to allow for the additional width in the opening for the wall case. The duct adapter mounting brackets should be mounted prior to installing the case in the wall.

Refer to pages 38 and 39 for drawings of ducted installations.

Prior to the installation of the transition from the room cabinet to the adapter, it will be necessary to remove the discharge grille from the room cabinet. Instructions for this modification are included with the duct adapter.

New Ducted Installations

Components

Duct Adapter RAK6052

Duct Adapter RAK6052 — The duct adapter is secured to each side of the wall case and requires the drilling of mounting holes in the wall case during installation. A template for the hole location is in the installation instructions. By securing the duct adapter to the wall case, the chassis retains the slide-out feature for servicing after the transition piece is removed.

Duct Extension RAK601 — This kit contains a 44"-long insulated duct, a register mounting collar, and an air supply register. It can be secured to the duct adapter at either end of the adapter. This duct may be cut at any dimension and used in two applications providing the sum of the two duct lengths necessary does not exceed the 44" length. Even in single applications the mounting flange must be cut off one end of the duct to accept the collar and supply register.

RAK601 Duct Extension, Mounting Collar and Register

Mounting Collar and Supply Register RAK602 —These components are included in the Duct Extension Kit RAK601. They may be ordered separately for installations where two duct extensions are made from one RAK601.

Ducted Application Considerations

When designing a ducted application, some application considerations to be made include:

1. Do not exceed the 15-foot-length maximum for the duct extension. Field-supplied duct extension must be completely insulated with minimum of 1/2" insulation
2. The duct **must be a straight run**. Turns or bends in the duct extension create air pressure drops that the unit is not designed to overcome.
3. Turn the "Duct Mode" on in the auxiliary control settings (Mode 7). This increases the fan speed to ensure proper circulation.
4. Minimum recommended clearance between the unit and the adjacent wall is 2".
5. Provisions for return air must be made to allow air circulation from secondary room. Doors in both secondary and primary rooms may be undercut or a return grille may be installed through a common wall.
6. When calculating the heat gain/heat loss take both areas into consideration.

Replacements of Existing Ducted Units

Since the design of the Zoneline chassis has changed over the years to provide better performance and appearance, some of the components used in ducted applications have changed. Select the proper components from the information below. The best procedure in determining the correct kit is to measure duct extension cross section.

Flat-Top Discharge Units (Zoneline Units Built Prior to 1988)

Existing Duct Extension Cross Section Measurements: 8-3/8" height x 6-1/2" width

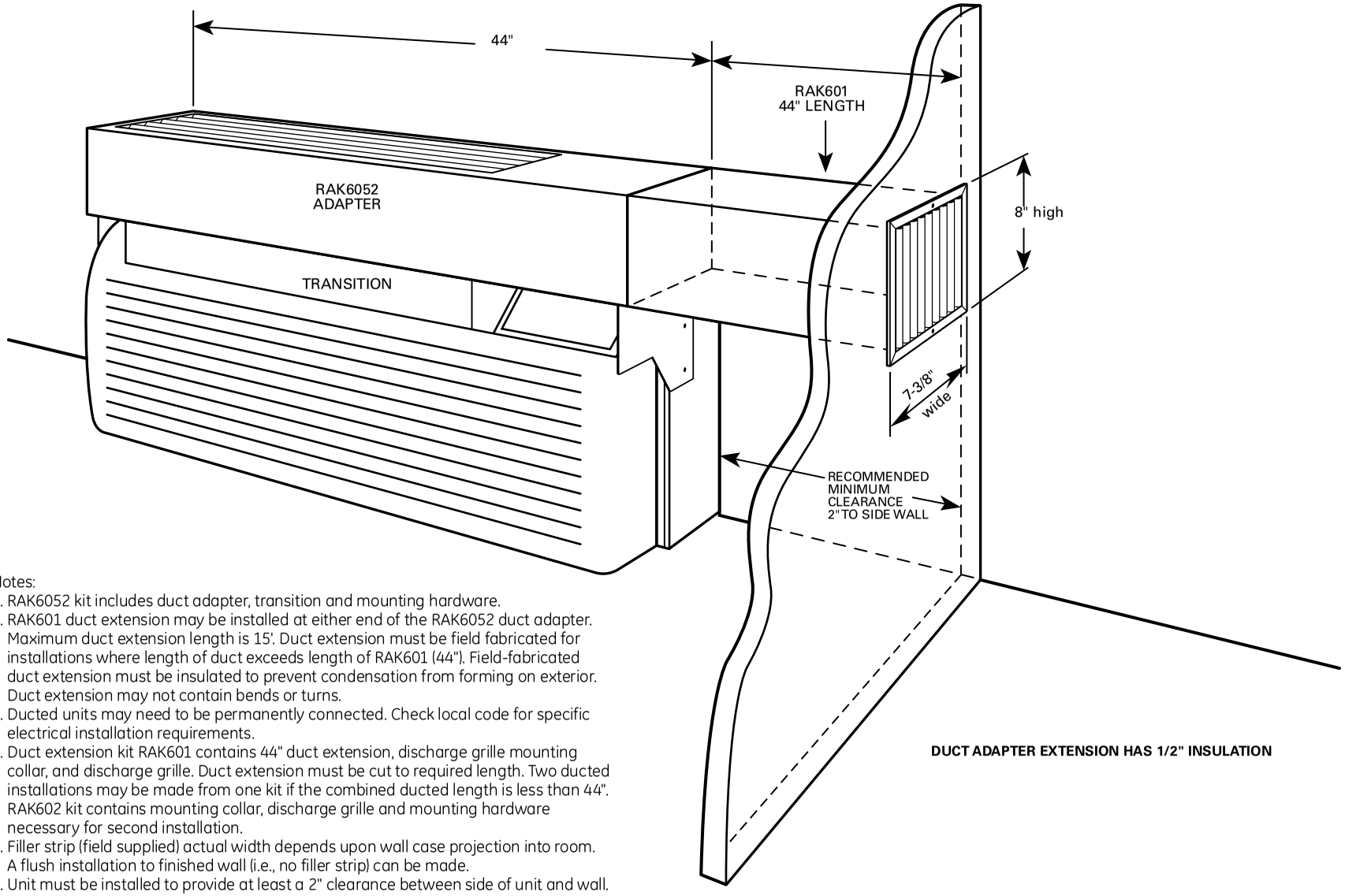
Duct Adapter RAK7012 — This duct adapter will allow the replacement of a new chassis (4100 or 6100 Series unit) into an existing ducted application. This adapter will align properly with the duct extension and will eliminate the need to modify the wall opening. In order to minimize replacement costs, some of the components of the old duct adapter must be removed and used in the new installation. Consult the Installation Instructions of the RAK7012 before removing and discarding the old duct adapter. See additional notes page 56.

Slope-Front Discharge Units (Models With AZC, AZR, AZW, or AZ21 or AZ31 Prefix)

Existing Duct Extension Cross Section Measurements: 7-3/32" height x 6-1/2" width

Duct Transition RAK7022 — This duct transition will allow the replacement of a new slope-front discharge Zoneline chassis (4100 or 6100 Series unit) into a previous-design slope-front ducted installation. See additional notes page 56.

DUCTED APPLICATION (AZ2500/2800/2900/3500/3800/3900/4100/6100 SERIES)

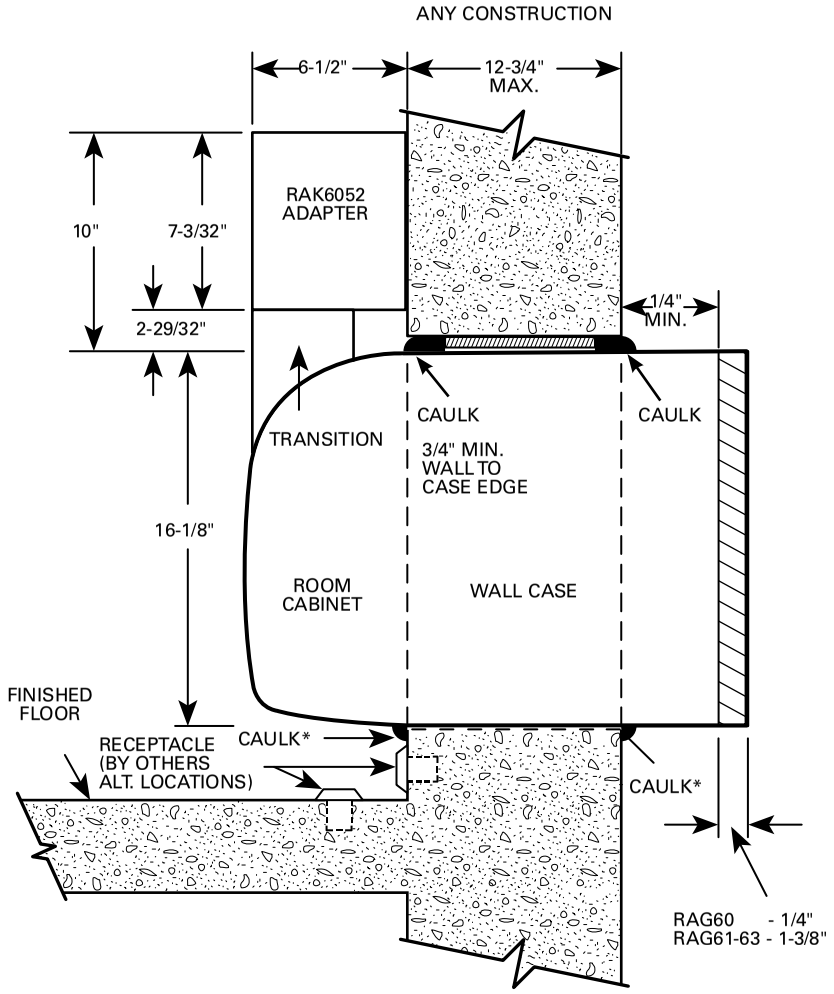


Notes:
1. RAK6052 kit includes duct adapter, transition and mounting hardware.
2. RAK601 duct extension may be installed at either end of the RAK6052 duct adapter. Maximum duct extension length is 15'. Duct extension must be field fabricated for installations where length of duct exceeds length of RAK601 (44"). Field-fabricated duct extension must be insulated to prevent condensation from forming on exterior. Duct extension may not contain bends or turns.
3. Ducted units may need to be permanently connected. Check local code for specific electrical installation requirements.
4. Duct extension kit RAK601 contains 44" duct extension, discharge grille mounting collar, and discharge grille. Duct extension must be cut to required length. Two ducted installations may be made from one kit if the combined ducted length is less than 44". RAK602 kit contains mounting collar, discharge grille and mounting hardware necessary for second installation.
5. Filler strip (field supplied) actual width depends upon wall case projection into room. A flush installation to finished wall (i.e., no filler strip) can be made.
6. Unit must be installed to provide at least a 2" clearance between side of unit and wall.
7. Provisions for return air must be made in order to allow air circulation from secondary room. Doors in both secondary and primary rooms may be undercut or a return grille may be installed through common wall.
8. For replacement of previous-design units, see pages 37 and 56.

DUCTED DETAILED SIDE VIEWS (AZ2500/2800/2900/3500/3800/3900/4100/6100 SERIES)

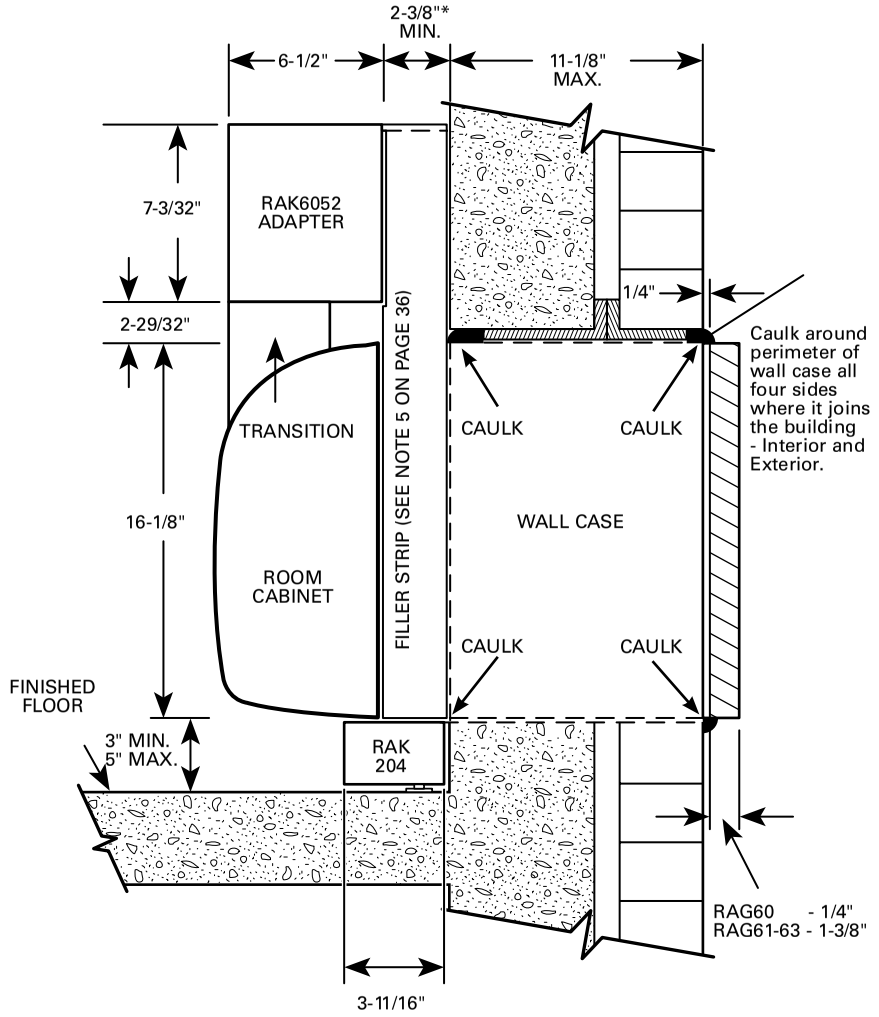
See page 38 for all notes

Line Cord Installation



*Caulk around perimeter of wall case all four sides where it joins the building - Interior and Exterior.

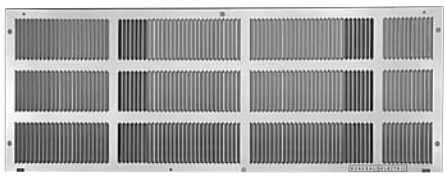
Sub-Base Installation



*2-3/8" min. when installed with RAK204.

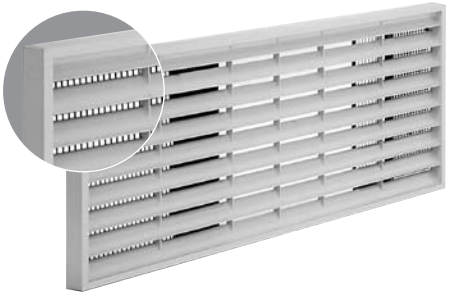
Exterior Grilles

Four styles of outdoor grilles are available for exterior treatments. The standard stamped aluminum grille (RAG60), the molded architectural louvered exterior grilles (RAG61-63) and the extruded aluminum architectural louvered grille (RAG67). All grilles include air deflectors (RAK40) and gaskets to prevent condenser air recirculation.



RAG60
Outdoor Grille

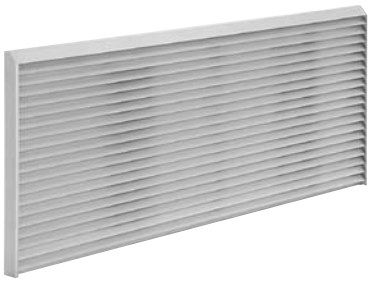
RAG60 Outdoor Grille — The standard exterior grille is made of durable aluminum to protect chassis components and prevent air recirculation.



RAG61
Outdoor Grille

RAG61, 62, 63 Architectural Grille — One-piece optional molded grille and frame assembly provides improved appearance, protection and weatherability. Molded of durable polycarbonate, the surfaces of the grille have a colorfast, slightly textured finish which blends well with most types of wall surfaces. The grilles can be painted in the field to match the building for improved aesthetics.

Colors: RAG61 — Beige
RAG62 — Dark Maple
RAG63 — Bittersweet Chocolate



RAG67

RAG67 Extruded Aluminum Grille — The RAG67 is made from extruded anodized aluminum for use where an aluminum architectural grille is preferred. The RAG67 is available in a clear finish and may be special ordered from GE in other colors. Minimum order quantities may be required. Contact your General Electric salesperson for details.

All grilles are installed and secured to the wall case from the inside. Keyhole slots in the rear flange of the case allow the grille to be placed in position before securing it firmly to the wall case.

Replacement of existing units: If an existing grille is not replaced, capacity and efficiency will be reduced and the unit may fail to operate properly or fail prematurely. A deflector kit, RAK40, must be used with grilles that were not designed for current AZ Series GE Zoneline® units. The RAK40 contains air deflectors and gaskets that mount to the chassis to direct the hot exhaust air away from the air intake to allow the unit to function properly. All grilles used with GE Zoneline units must comply with requirements of Exterior Architectural Treatments and Special Outdoor Grilles as follows.

Exterior Architectural Treatments and Special Outdoor Grilles

The architectural design of a building may dictate the use of special or oversized louvers for aesthetic reasons. Louvers other than standard Zoneline exterior grilles may be used on the Zoneline unit, however, these special louvers, or any special exterior architectural treatments of the building facade that may restrict the free circulation of condenser airflow, should be referred to GE Application Engineering for evaluation and approval. The following guidelines should be followed in selecting a louver:

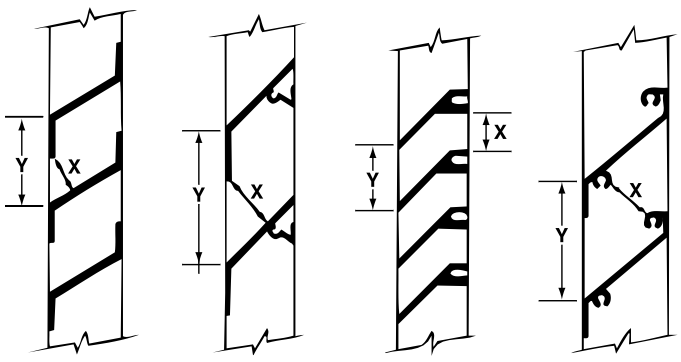
1. **The louver must have a minimum of 65% free area.** ASHRAE defines free area as the minimum area of the opening in an air inlet or outlet through which air can pass. Percent (%) free area equals the X dimension divided by the Y dimension.
2. The louver should be attached to the wall case in a manner that will prevent recirculation of condenser discharge air into the air inlet. If the louver is not attached directly to the wall case, a field-supplied splitter or gasket is required between the chassis and the louver to prevent recirculation.

It is important that the above criteria be followed since a louver that is too restrictive or allows recirculation will reduce the unit's capacity and efficiency, increase the electrical current draw, cause intermittent operation due to the compressor overload protector shutting the compressor off, and cause failure of the compressor overload and shorten compressor life. Using the unit with a grille that is too restrictive or allows recirculation ***may constitute improper installation and will void the unit's warranty***. A scale drawing of the louver section should be sent to GE Application Engineering. To assure the proper performance of the Zoneline unit and comply with Underwriters Laboratories requirements, it may be necessary to send a sample louver section (at least 16" x 42") to an independent lab to be tested with the Zoneline unit.

Sample Calculations

$$\text{Free Area (\%)} = \frac{x}{y} \times 100 \qquad x = 1" \quad y = 1.5"$$

$$\text{F.A. \%} = \frac{1}{1.5} \times 100 = 66.7\%$$



Power Connection for 4100 and 6100 Series Zoneline® Units

All 4100 and 6100 Series Zoneline units are equipped with universal heaters allowing chassis installation flexibility. The Zoneline units are connected to the building power supply by a unique power connection kit. By utilizing a separate universal power connection (UPC) kit, each unit is capable of providing various outputs of electric resistance heat to more closely meet the heating requirements of the particular room, thereby increasing the installation flexibility of the particular chassis. This power connection kit is the only means of supplying power to the Zoneline chassis. The appropriate kit is determined by the voltage, the means of electrical connection, either line-cord connected or permanently connected, and the desired resistance heat output that may be supported by the branch circuit.

230/208-Volt Line-Cord Connected Units

Line Cord Kits consist of a self-aligning nine-pin molded connector that plugs into a mating connector on the Zoneline chassis and insulated line cord with an electrical plug on the end. The configuration of the electrical plug conforms to NEC standards for the circuit amperage and the position of the wires in the nine-pin connector determines the heater wattage and current requirements when it is plugged into the Zoneline chassis.

The power connection kit is selected by the amperage of the circuit where it will be installed. Each line cord kit has an integral Leakage Current Detection and Interruption (LCDI) or Arc Fault Current Interrupter (AFCI) device as required by the National Electrical Code (NEC) and Underwriters Laboratory (UL) for line-cord connected air conditioners manufactured on or after August 1, 2004. The line-cord power connection kits are shown in the table below.

230/208-Volt Line-Cord Connected Units

Line Cord Kit	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK3153A	8150/7900	2400/2320	11.0/11.6	15
RAK3203A	11200/10900	3300/3200	15.1/16.0	20
RAK3303A	16000/15450	4700/4530	21.2/22.4	30

Electric Heat Amps include electric heater and fan motor current draw.

230/208-Volt Permanently Connected Units

Permanently connected units do not require the LCDI or AFCI device. Permanent connection is usually made through the use of a sub-base. Each 230/208-volt sub-base consists of a sub-base with appropriate receptacle for minimum circuit amperage, a chaseway to route power connector from the sub-base to the chassis, wiring to connect the sub-base to building wiring and a short line cord with a self-aligning nine-pin connector to connect to chassis and plug into the receptacle in the sub-base. Permanent, or direct-wired, installation of a 230/208-volt unit requires a junction box kit, RAK4002A, which attaches to the chassis to form an enclosed junction box.

The short sub-base line cord may not be used without the sub-base.

For 4100 and 6100 Series 230/208-volt units where a permanent installation using flexible conduit is desired, the RAK4002A forms an enclosed junction box on the chassis. The RAK4002A has a 7/8"-diameter hole to allow conduit to be connected to the junction box. For direct connection, purchase and install the appropriate Universal Power Supply Kit (also referred to as the Direct Connection Kit below) that matches the ampacity of the building circuit connected to the unit. This nine-pin connector with three 7"-long conductor wires is used for direct connections to the building wiring inside a direct-connect junction box. These wires are then connected to the building wiring by field-supplied connectors.

230/208 Volt Sub-Base and Direct-Connected Units

Sub-Base	Direct Connection Kit	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK204D15P	RAK4157	8150/7900	2400/2320	11.0/11.6	15
RAK204D20P	RAK4207	11200/10900	3300/3200	15.1/16.0	20
RAK204D30P	RAK4307	16000/15450	4700/4530	21.2/22.4	30

Electric Heat Amps include electric heater and fan motor current draw.

265- or 277-Volt Unit Installation — Permanently Connected Units

National Electric Code (Article 440.60) requires permanent connection for units connected to power sources over 250 volts; therefore these units must be permanently connected (direct-wired) with field-supplied connectors. Units connected using a sub-base meet the requirement for permanent connection since all wiring is internal wiring between the sub-base and the chassis.

Since 265-volt units may not be line-cord connected, an LCDI device is not required.

265 Volt Sub-Base and Direct-Connected Units

Sub-Base	Electric Heat BTUH	Electric Heater Watts	Electric Heat Amps	Min. Circuit Protection (Amps)
RAK3153A	8150	2400	9.6	15
RAK3203A	11550	3400	13.3	20
RAK3303A	16350	4800	18.6	30

Electric Heat Amps include electric heater and fan motor current draw.
Each 265-volt sub-base kit consists of a sub-base with appropriate receptacle for minimum circuit amperage, a chaseway to route the power connector from the sub-base to the chassis and wiring to connect the sub-base to the building wiring.

The 265-volt power connection kit must be ordered separately.

All wiring must conform to local electrical regulations and codes.

Essential Elements Ordering Overview

230/208-volt line-cord connected units — order line cord kit.

230/208-volt sub-base connected units — order sub-base (includes power connection kit) and junction box for chassis (if hard wired).

265-volt units — order sub-base and power connection kit separately.

Electrical Wiring Information – 4100/6100 Series

All Zonelines are single-phase 60 hertz units.

For all installations, the feeder, sub-feeder, branch circuit and electrical protective devices and selection must conform to the National Electrical Code and to local codes.

Maximum connected load in amperes, including demands for the electric heater and the fan motor, are shown on page 44. Branch circuit ampacity and electrical protective device sizing are shown on page 42 for 230/208-volt and for 265-volt units.

More than one unit per branch circuit is not recommended. When in doubt, consult the National Electrical Code. All wiring, including installation of receptacle, must conform to local electrical regulations and codes.

Replacement of Existing Chassis

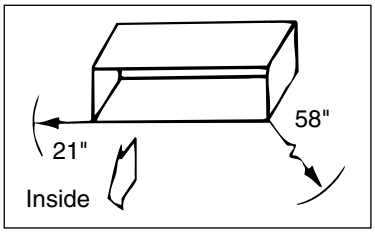
230/208-Volt and 265-Volt Units

There have been changes to NEC and improvements and modifications to the Zoneline chassis and sub-bases since the unit was first introduced. Some of these changes require alterations to be made when replacing an older unit with a new chassis.

Line-Cord Connected Units

The plug configuration of new line-cord connected units complies with the current NEC standards. Older installations may have wall receptacles that conformed to NEC standards at the time the building was constructed and may not match the configuration of the plug on the new line cord. The recommended solution is to change the wall receptacle to conform to current standard plug configuration. See chart on this page for current receptacle configuration.

Typical Line-Cord Power Connection Kit RAK3203A shown



Maximum Cord Extension

Permanently Connected Units With Sub-Base

If the existing unit is connected to a sub-base, the installation of the new unit may involve modifying the existing installation slightly. It is recommended these modifications be made by a qualified electrician.

If the existing sub-base is the full width of the wall case, RAK201 sub-base access plate may be ordered and used to replace the cover on the old sub-base. Field-supplied wiring, conduit and conduit connectors should be used to make a connection between the new chassis and the center knockout of the RAK201. The wiring connections should be made inside the sub-base and the RAK201 attached to the sub-base with the two screws provided.

If the existing sub-base is not the full width of the wall case, the electrician will have to modify the existing cover plate to allow field-supplied wiring, conduit and conduit connectors to be run from the permanent connection kit to the sub-base.

Enclosure cover removed.

RAK4002A
Wiring harness can be ordered separately as RAK4002CW.

Receptacle

Type	Mfg	Part No	Configuration
15 AMP Tandem NEMA6-15R	Hubbell P&S	5661 5661	
20 AMP Perpendicular NEMA6-20R	Hubbell P&S	5461 5871	
30 AMP Large Tandem NEMA6-30R	Hubbell P&S	9330 5930	

Maximum Connected Load

The maximum connected load of a Zoneline® unit occurs when the unit is in resistance heating operation. The maximum amperage shown in the tables below is the combined total of the resistance heater and the indoor fan motor.

230/208-Volt Line-Cord Connected Units

	Power Connector Kit					
	RAK3153A RAK4157 RAK204D15P		RAK3203A RAK4207 RAK204D20P		RAK3303A RAK4307 RAK204D30P	
MODEL NUMBER	230 V	208 V	230 V	208 V	230 V	208 V
AZ41E07DA*	11.0	11.6	15.1	16.0	N/A	N/A
AZ41E09DA*	11.0	11.6	15.1	16.0	21.2	22.4
AZ41E12DA*	11.0	11.6	15.1	16.0	21.2	22.4
AZ41E15DA*	11.0	11.6	15.1	16.0	21.2	22.4
AZ61H07DA*	11.0	11.6	15.1	16.0	N/A	N/A
AZ61H09DA*	11.0	11.6	15.1	16.0	21.2	22.4
AZ61H12DA*	11.0	11.6	15.1	16.0	21.2	22.4
AZ61H15DA*	11.0	11.6	15.1	16.0	21.2	22.4

*All versions
Electric Heat Amps include electric heater and fan motor current draw.
Values shown in table above are also the total connected loads for units installed with sub-bases.
RAK204D15P — same as RAK3153
RAK204D20P — same as RAK3203
RAK204D30P — same as RAK3303

265-Volt Units

	Sub-Base/Power Connector Kit		
	RAK204E15 RAK5172 RAK5157	RAK204E20 RAK5202 RAK5207	RAK204E30 RAK5302 RAK5307
MODEL NUMBER	265 V	265 V	265 V
AZ41E07EA	9.6	13.3	N/A
AZ41E09EA*	9.6	13.3	18.6
AZ41E12EA*	9.6	13.3	18.6
AZ41E15EA*	9.6	13.3	18.6
AZ61H07EA*	9.6	13.3	N/A
AZ61H09EA*	9.6	13.3	18.6
AZ61H12EA*	9.6	13.3	18.6
AZ61H15EA*	9.6	13.3	18.6

*All versions
Electric Heat Amps include electric heater and fan motor current draw.

Latent System Capacity

The total capacity of an air conditioner is made up of the **sensible** capacity, the output of the unit used to remove heat from the air in the area being conditioned, and the **latent** capacity, the output of the unit used to dehumidify the air in the area being conditioned. For humid climates and applications, the sensible/latent capacity split of the unit should be considered. The sensible capacity listed in the specification charts on page 55 is at a standard rating condition of 95°F dry bulb/75°F wet bulb outdoors; 80°F dry bulb/67°F wet bulb indoors. The latent system capacity is 1.00 minus the Sensible capacity. (If the Sensible capacity is listed at .74 the Latent capacity is .26. This means that 74% of the capacity of the unit is used to remove heat from the air and 26% is used to remove moisture form the air at standard test conditions.)

In some applications information about the Sensible/Latent split, or ratio, at conditions other than the standard rating conditions is needed.

Normal Yearly Operating Data

(Cooling Hours based on 75°F indoor temperature with air conditioner sized to meet the design conditions.)

Location	ASHRAE Heating Degree Days	Estimated Cooling Hours
ALABAMA		
Birmingham	2,551	1,390
Huntsville	3,070	1,340
Mobile	1,560	1,640
Montgomery	2,291	1,580
ARIZONA		
Flagstaff	7,152	310
Phoenix	1,765	2,280
Tucson	1,800	1,920
Yuma	974	2,520
ARKANSAS		
Fort Smith	3,292	1,410
Little Rock	3,219	1,330
CALIFORNIA		
Bakersfield	2,122	1,530
Fresno	2,611	1,210
Los Angeles	2,061	310
Sacramento	2,502	1,030
San Diego	1,458	390
San Francisco	3,015	110
COLORADO		
Colorado Springs	6,423	520
Denver	6,283	550
Grand Junction	5,641	910
CONNECTICUT		
Hartford	6,235	480
DISTRICT of COLUMBIA		
Washington	4,224	1,010
DELAWARE		
Wilmington	4,930	770
FLORIDA		
Jacksonville	1,239	1,690
Miami	214	2,850
Orlando	766	1,930
Tallahassee	1,485	1,500
Tampa	683	2,350
GEORGIA		
Atlanta	2,961	1,130
Augusta	2,397	1,400
Macon	2,136	1,440
Savannah	1,819	1,510
IDAHO		
Boise	5,809	670
Lewiston	5,542	600
Pocatello	7,033	570
ILLINOIS		
Chicago	6,155	780
Moline	6,408	760
Springfield	5,429	890
INDIANA		
Evansville	4,435	1,090
Fort Wayne	6,205	710
Indianapolis	5,699	820
South Bend	6,439	600
IOWA		
Burlington	6,114	730
Des Moines	6,588	710
Sioux City	6,951	770
KANSAS		
Dodge City	4,986	1,020
Goodland	6,141	800
Topeka	5,182	880
Wichita	4,620	1,070

Location	ASHRAE Heating Degree Days	Estimated Cooling Hours
KENTUCKY		
Lexington	4,683	830
Louisville	4,660	1,130
LOUISIANA		
Alexandria	1,921	1,670
Baton Rouge	1,560	1,860
New Orleans	1,385	1,790
Shreveport	2,184	1,470
MAINE		
Portland	7,511	290
MARYLAND		
Baltimore	4,654	850
MASSACHUSETTS		
Boston	5,634	500
MICHIGAN		
Detroit	6,293	590
Flint	7,377	440
Grand Rapids	6,894	530
MINNESOTA		
Duluth	10,000	200
Minneapolis	8,382	550
MISSISSIPPI		
Jackson	2,239	1,560
MISSOURI		
Columbia	5,046	960
Kansas City	4,711	1,210
Springfield	4,900	970
St. Louis	4,900	1,080
MONTANA		
Billings	7,049	520
Glasgow	8,996	410
Great Falls	7,750	420
Missoula	8,125	350
NEBRASKA		
Grand Island	6,530	770
Omaha	6,612	750
NEVADA		
Ely	7,733	500
Las Vegas	2,709	1,980
Reno	6,332	520
NEW JERSEY		
Newark	4,589	710
NEW MEXICO		
Albuquerque	4,348	1,040
Clayton	5,158	720
Silver City	3,705	1,260
NEW YORK		
Albany	6,875	480
Binghamton	7,286	310
Buffalo	7,062	450
New York	4,811	790
Rochester	6,748	470
Syracuse	6,756	500
NORTH CAROLINA		
Asheville	4,042	690
Charlotte	3,191	1,230
Raleigh	3,393	1,070
Winston-Salem	3,595	960
NORTH DAKOTA		
Bismarck	8,851	510
Fargo	9,226	490
Williston	9,243	580

Location	ASHRAE Heating Degree Days	Estimated Cooling Hours
OHIO		
Cincinnati	5,265	840
Cleveland	6,351	610
Columbus	5,660	810
Dayton	5,622	740
Toledo	6,494	590
OKLAHOMA		
Oklahoma City	3,725	1,200
Tulsa	3,860	1,410
OREGON		
Medford	5,008	620
Pendleton	5,127	590
Portland	4,635	270
PENNSYLVANIA		
Harrisburg	5,251	730
Philadelphia	5,144	810
Pittsburgh	5,987	590
Scranton	6,254	440
Williamsport	5,934	600
RHODE ISLAND		
Providence	5,954	470
SOUTH CAROLINA		
Charleston	2,033	1,390
Columbia	2,484	1,440
Greenville	2,980	1,120
SOUTH DAKOTA		
Rapid City	7,345	580
Sioux Falls	7,839	610
TENNESSEE		
Chattanooga	3,254	1,180
Knoxville	3,494	1,070
Memphis	3,232	1,320
Nashville	3,578	1,220
TEXAS		
Corpus Christi	914	2,380
Dallas	2,363	1,900
El Paso	2,700	1,580
Houston	1,396	1,850
Lubbock	3,578	1,310
San Antonio	1,546	1,920
UTAH		
Milford	6,497	910
Salt Lake City	6,052	830
VERMONT		
Burlington	8,269	130
VIRGINIA		
Norfolk	3,421	1,010
Richmond	3,865	1,020
Roanoke	4,150	870
WASHINGTON		
Seattle	5,145	180
Spokane	6,655	430
Yakima	5,941	530
WEST VIRGINIA		
Charleston	4,476	860
Huntington	4,446	820
WISCONSIN		
Madison	7,863	530
Milwaukee	7,635	450
WYOMING		
Casper	7,410	600
Cheyenne	7,381	420
Sheridan	7,680	530

Formula for Calculating Operating Costs Using Above Data:

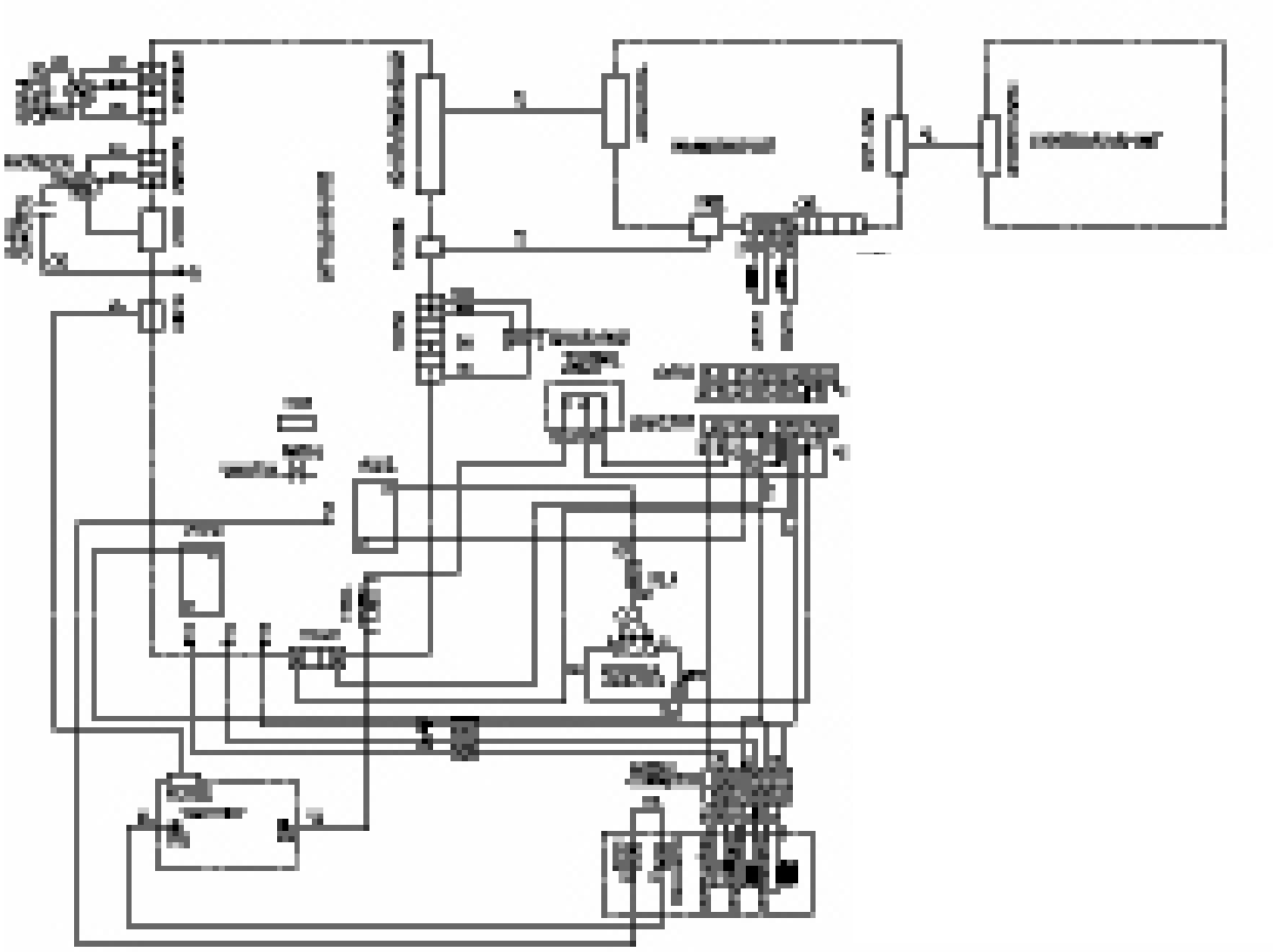
$$\textbf{Heating*} — \frac{\textbf{Heat Loss KW x Heating Degree Days x "C" x Cost Per KWH}}{\textbf{Outdoor Design Temperature Difference}} = \textbf{Operating Cost}$$

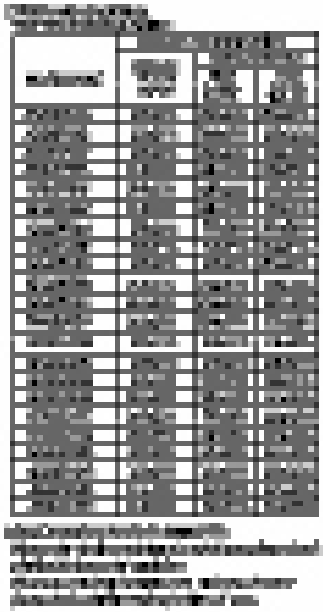
*The above formula is for electric resistance heating only. Power consumption using the Zoneline heat pumps should be adjusted by Seasonal Performance Factor (SPF).

The local power supplier should be consulted for recommended value of "C." This factor will vary between 17 and 24.

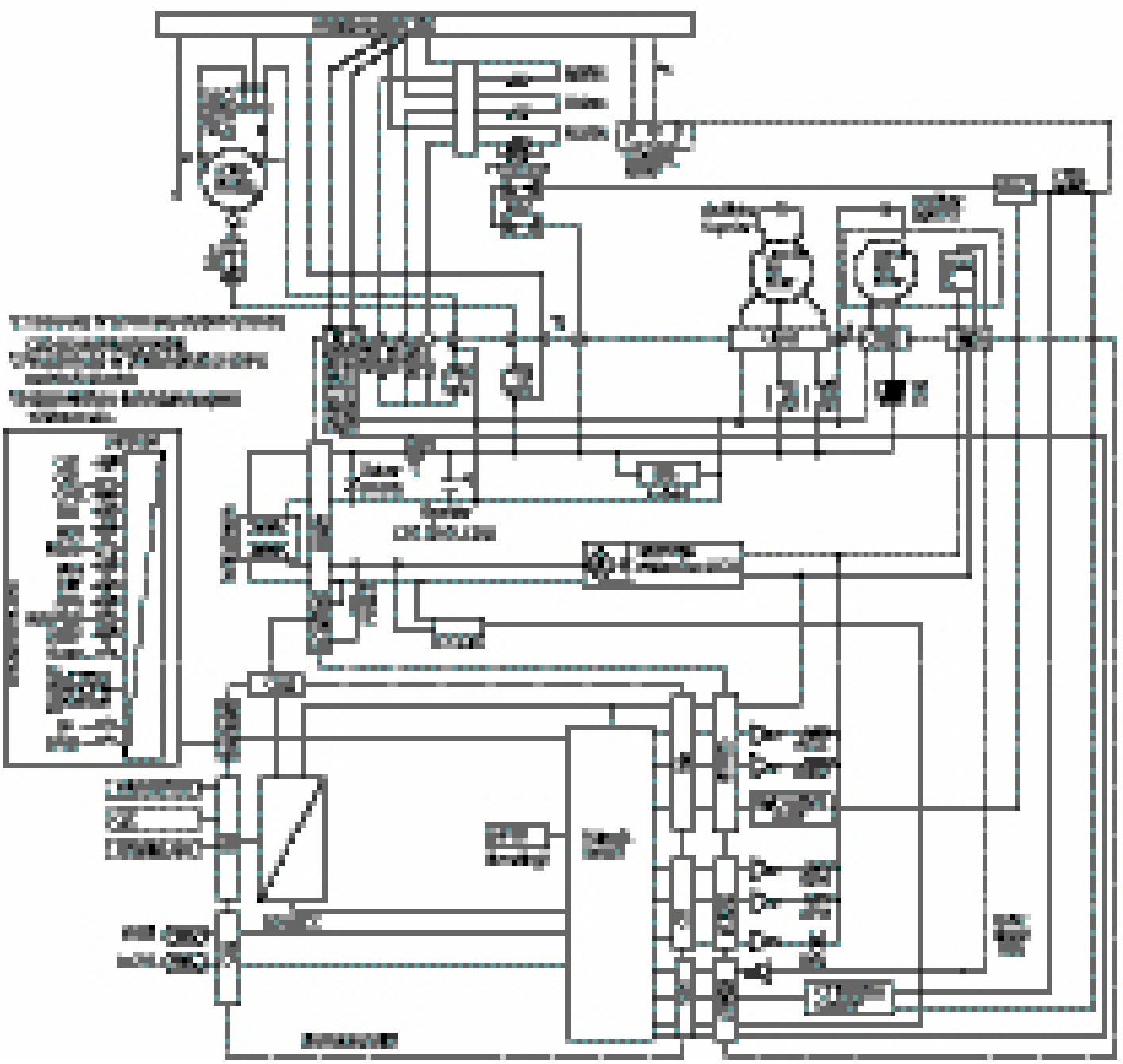
$$\textbf{Cooling} — \frac{\textbf{Calculated Heat Gain (BTUH)}}{\textbf{Installed unit capacity (BTUH)}} \textbf{ x} = \frac{\textbf{Unit Cooling Watts}}{\textbf{1000 Watts/KW}} \textbf{ x Cooling Hours x Cost per KWH = Operating Cost}$$

Typical 4100 Series, 230/208-Volt Wiring Diagram

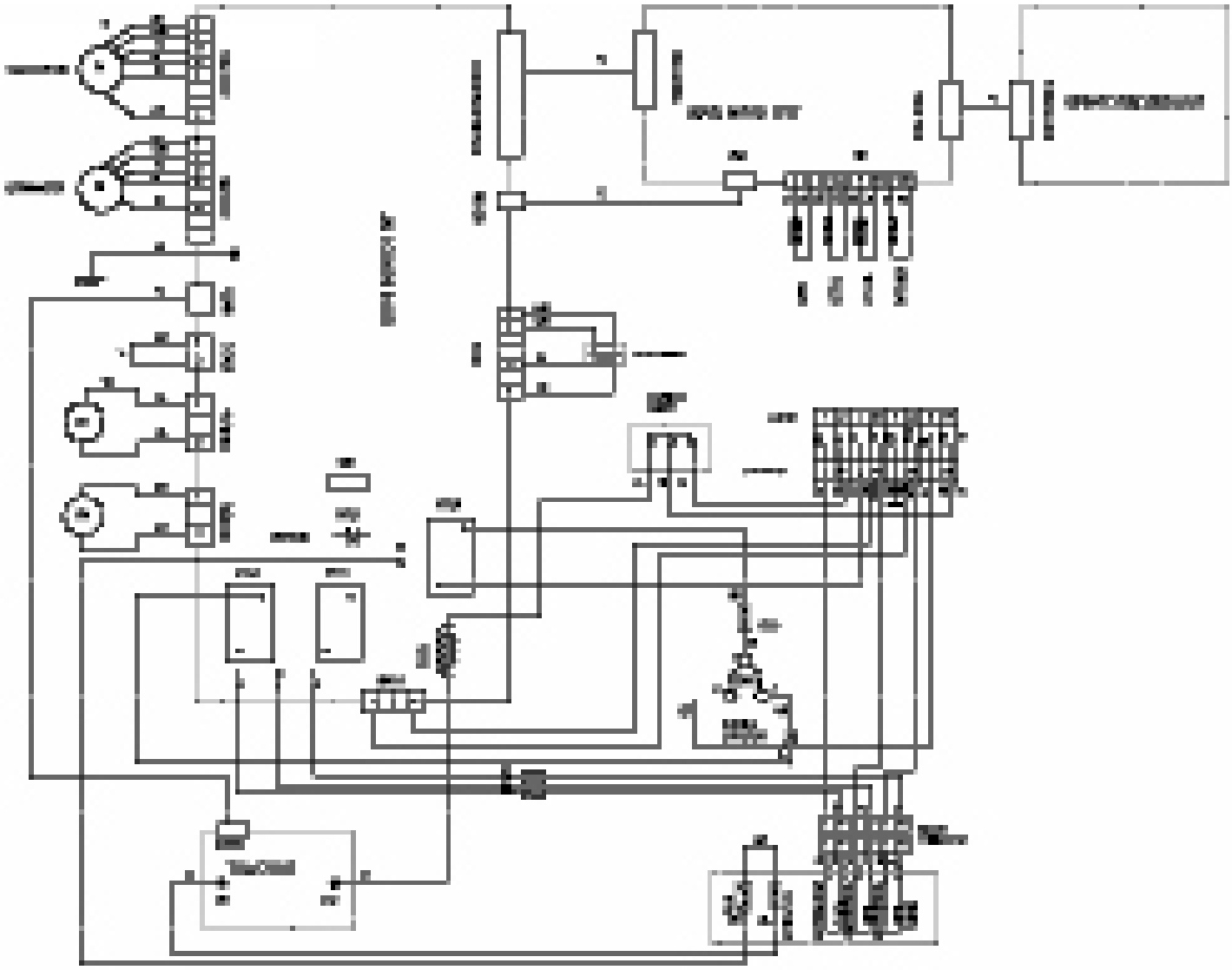


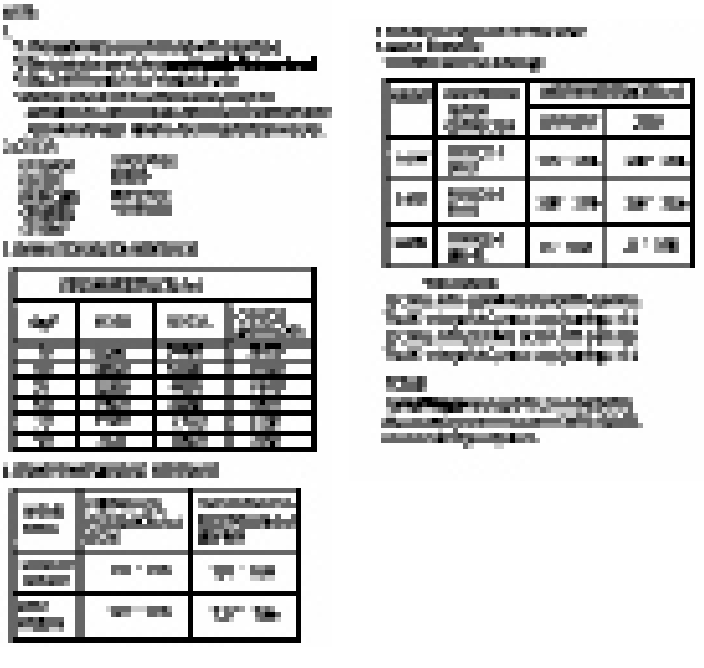


Typical 4100 Series, 230/208-Volt Schematic Diagram

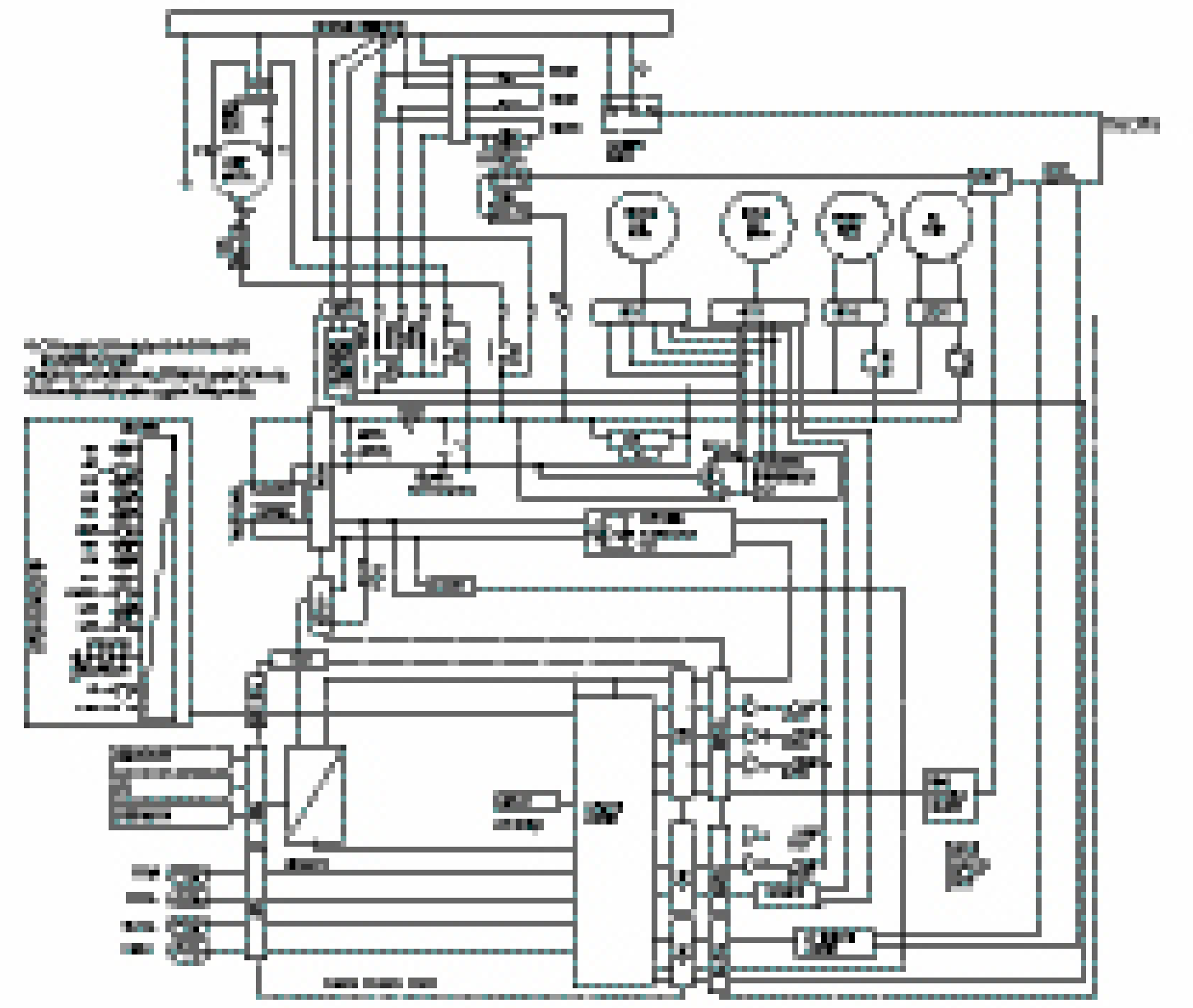


Typical 6100 Series, 230/208-Volt Wiring Diagram





Typical 6100 Series, 230/208-Volt Schematic Diagram



Suggested Bid Form Specifications

The following are suggested specifications for the Zoneline® 4100 Series Packaged Terminal Air Conditioner and the 6100 Series Packaged Terminal Heat Pump.

The contractor will furnish Packaged Terminal Air Conditioners of the sizes and capacities shown on the schedule and in the specifications. The units shall be located as shown on the drawings and each shall consist of a chassis, room cabinet, wall case, sub-base if specified, and outdoor grille.

Units shall be listed by UL, and ARI and cUL certified as to capacity and efficiency and shall be GE Zoneline models or equal. Unit dimensions shall not exceed 42-1/8" wide and 16-1/4" high with room cabinet in place.

Units shall be designed to operate on (208) (230) (265) volts, 60 Hz., single-phase power.

Chassis. The air conditioner chassis shall be the standard product of the manufacturer and shall be shipped in protective cartons to prevent damage. Cartons shall be appropriately marked at the factory with wording sufficient to warn handlers against improper stacking, up-ending, rolling or dropping.

The chassis shall be the slide-in type, ready to operate after installation.

Each shall consist of the following sections and components:

- Each unit shall have a matching, easily removable, textured finish, wrap-around room cabinet molded of high-temperature styrene to resist corrosion and damage. The room cabinet shall have slide-out washable filters accessible without requiring removal of room cabinet from chassis;
- Hermetically sealed refrigerant system with external vibration isolated rotary-type compressor, condenser and evaporator coils and capillary refrigerant control. Airflow system consisting of one permanently lubricated two-speed fan motor for the outdoor fan and a separate permanently lubricated two-speed fan motor for the indoor fan. Outdoor fan shall be multi-blade axial-flow design made of non-corrosive material. Indoor fan shall be of a design to optimize airflow and operating sound. All motors on the exterior side of the weather barrier shall be of an enclosed design to reduce the effects of moisture and corrosion;
- Line-cord connected units shall require a line-cord power connection kit with integral Leakage Current Detection and Interruption device or Arc Fault Current Interrupter as required by National Electrical Code® (NEC) and Underwriters Laboratories. The unit shall have a universal resistance heater with output determined by connection to the power source with the appropriate power connection kit to provide specified heat output;
- A fan-cycle switch to permit continuous fan operation or fan cycle operation, independently selectable for heating and cooling operation;
- Fan-only operation in either high or low fan speed selectable by room occupant;
- A positive cooling condensate disposal system which meets the test requirements of applicable A.R.I. Standard 310 (for Packaged Terminal Air Conditioners) and 380 (for Packaged Terminal Heat Pumps) (80°F dry bulb, 75°F wet bulb, 80% relative humidity);
- Condenser and evaporator coils to be constructed of copper tubing and aluminum plate fins designed to achieve EER and COP rating of the unit;
- Indoor and outdoor airflows that match the capacity of the coils for efficient heat transfer. Water blow-off shall not occur on the indoor coil;
- Adjustable indoor discharge air louvers that provide a 50° off vertical air pattern with an alternate position to provide a 40° off vertical air pattern;
- Easily accessible controls for selection of unit operation and thermostat setting. Controls shall be covered by a hinged door;
- Positive-closing, manually controlled, three-position fresh-air vent capable of providing selection of fully open, partially open or closed setting. Vent door is to be secured for shipping;
- Solid-state thermostat control to sense room temperature;
- Electronic temperature limiting with seven independent heating and cooling settings to limit maximum and minimum temperatures without restricting movement of thermostat control knob;
- Freeze Sentinel™ to automatically activate the electric resistance heater and fan motor to warm and circulate indoor air to help prevent damage due to freezing temperatures. Freeze Sentinel shall operate as long as unit is connected to powered electrical circuit and unit shall provide ability for owner to defeat the Freeze Sentinel operation;
- Heat Sentinel to automatically activate air conditioner operation when the unit is in the STOP setting when the room temperature warms to 85°F and turns air conditioner operation off when the room temperature cools to 80°F, if selected by owner;
- Compatible with two-wire Central Desk Control systems;
- Remote Thermostat compatibility with Class 2 remote thermostat;
- Connections to interface with a transfer fan to move air into another room;

Unit shall have means of electrical connection listed by Underwriters Laboratories and compatible with the unit's required voltage and ampacity in conformance with National Electrical Code and local codes.

Additional specifications for GE Zoneline 6100 Series Packaged Terminal Heat Pumps

Heat pump units shall provide operation that will either: A) automatically phase in electric resistance heat, if outdoor temperature is below 46°F, if heat pump alone is unable to maintain room temperature; or B) use partial electric resistance heat simultaneous with heat pump operation any time the outdoor temperature is below 46;°F. Selection of A or B operation is made by means of a selector switch concealed from room occupant. In either A or B operation, the unit will switch to full resistance heat if room temperature continues to decline or the outdoor temperature falls below 25°F. If the outdoor temperature is above 46°F, unit will lock out electric resistance heat and operate on heat pump only.

Suggested Bid Form Specifications (continued)

Heat pump unit shall include Reverse Cycle Defrost that automatically begins a defrost cycle when microprocessor determines criteria for defrosting has been met. Defrosting shall be accomplished by systematically ceasing heat pump operation, pausing to allow internal refrigerant pressures to equalize, then operating the compressor with the flow of refrigerant reversed to allow the hot gas to flow through the outdoor coil, melting the accumulated frost. The unit shall automatically resume heat pump operation, after pausing to allow refrigerant pressures to equalize, at conclusion of defrost cycle.

The unit shall be equipped with a temperature-activated drain valve to allow water generated in heat pump operation and defrost cycles to drain into the wall case.

The unit shall have a switch concealed from room occupant to allow heat pump operation to be overridden and heat provided by electric resistance heat regardless of outdoor temperature.

In the event of compressor failure during heat pump operation, unit shall automatically switch to electric resistance heat to maintain selected room temperature regardless of outdoor temperatures.

Specifications for optional Internal Condensate Removal (ICR) system for 6100 Series heat pump units.

The unit shall have a factory-installed Internal Condensate Removal (ICR) system to permit unit to automatically dispose of heat-pump-generated condensate water with no overflow to outdoors during heating under outdoor ambient of 55°f dry bulb, 90% relative humidity; indoor ambient 70°f dry bulb, 52% relative humidity, for four hours of continuous run time.

Wall Cases and Grilles (needed for new installations.)

(Alternate specification for steel wall case)

Wall Case. The wall case shall be constructed of heavy-gauge, insulated, zinc-coated phosphated steel with a protective baked-on enamel finish. Bottom critical points of the steel wall case shall be coated with petroleum microcrystalline wax for added corrosion protection and shall meet ASTM B-117, 1800-hour hot air aerated salt spray test.

(Alternate specification for molded wall case)

Wall Case. The wall case shall be constructed of a non-corroding fiberglass-reinforced polyester compound.

Cases shall be installed through exterior walls where shown on the plans and shall be installed per manufacturer's installation instructions. In no instance shall fasteners be used through the bottom in order to retain the water integrity of the bottom of the wall case.

Outside weather panels shipped with the cases shall remain in place until the outdoor air louvers and chassis are installed, at which time they are to be removed and discarded by the installer.

Outside Grille. Each unit shall be equipped with a standard exterior grille that has been designed to allow unit operation in high ambient conditions. Grilles shall be of material and design specified.

Special grilles or customer louver sections to be supplied by others will conform to a minimum of 65% free area (as calculated by ASHRAE) to allow for proper unit operation and shall be submitted to the PTAC/PTHP manufacturer, if requested, for feasibility and airflow characteristics.

Specifications for Sub-Base (if required)

Sub-Base. Each unit shall have a field-installed UL-listed electrical sub-base. The sub-base shall be attached to the lower inside flange of the wall case prior to installation in the exterior wall. It shall include adjustable screws at the bottom corners to permit exact leveling of the wall case. The sub-base shall have a factory-installed receptacle to allow unit line cord to plug into mating receptacle and shall have a chaseway to contain and conceal the line cord. The sub-base shall have side panels adjustable from a minimum of 2-3/8" to a maximum of 13-3/4" to enclose the area under the wall case.

Weather Resistance. Complete unit including outside louver shall be submitted to an independent agency for weather-resistance tests.

Air-infiltration test to be conducted in accordance with ASTM E283-91. With static air pressure differential of 1.57 lb./ft.^{2} (.3" H^2O) equivalent to 25 mph wind, allowable air infiltration shall not exceed 7 ft.^{3}/min.

Water-infiltration test to be conducted in accordance with ASTM E331-86 with static air pressure differential of 10.0 lb./ft^2 (1.93" H^20) equivalent to 63 mph wind, 5.0 gal./ft^2 (8" rain/ft^2/hr.) for 15 minutes and there shall be no leakage into the room.

Approvals. Units shall be certified under the ARI and cUL certification program and listed by UL.

Service. Submit complete information with bid covering service availability to whom service on units will be assigned, along with complete address and phone number, including phone number of emergency service personnel.

Start-Up, Adjust, Demonstrate. Contractor shall be responsible for the initial starting of units, adjustments thereto, etc., to place the units in required operating condition. Contractor shall demonstrate to the owner or his representative the operation of units for both summer and winter functions.

Warranty. The warranty shall be a full one-year parts and labor on the entire unit, plus an additional full four years parts and labor for the sealed refrigerating system, including service call for diagnosis and transportation to and from service shop (if necessary) at no charge to the customer. The warranty shall also include a limited second-through-fifth-year parts-only warranty for fan motors, switches, thermostat, heater, heater protectors, compressor overload, solenoids, circuit boards, auxiliary controls, thermistors, frost controls, ICR pump, capacitors, varistors and indoor blower bearing.

Installation Responsibility. Units shall be installed according to the manufacturer's recommendations and the manufacturer shall not be responsible for unit failure as a result of improper installation, or unit performance when installed with accessories not approved by the manufacturer.

Zoneline® Chassis Nomenclature

The Zoneline chassis is identified by a model number defining the type of unit, cooling capacity, electrical information and optional features included on the unit. When specifying or ordering the Zoneline chassis use of this nomenclature will assure receiving the correct unit.

EXAMPLE

A	Z	6	1	H	1	2	D	A	D

Zoneline
packaged terminal chassis

Chassis series
41=deluxe line cool/electric heat
61=deluxe line heat pump

Unit type
E=cooling with electric resistance heat
H=heat pump with electric resistance heat

Nominal cooling capacity
07=7,000 BTUH cooling
09=9,000 BTUH cooling
12=12,000 BTUH cooling
15=15,000 BTUH cooling

Voltage/Phase/Frequency
D=230/208 Volt, single phase, 60 Hz
E=265 Volt, single phase, 60 Hz

Universal power connection

Special Features
B=base unit
C=corrosion treated
D=internal condensate removal (ICR) system (heat pump models only) (not for coastal areas)
P=Dry Air 25

Receptacles/Sub-Bases

Tandem
230/208V 15 Amp
NEMA6-15R

Perpendicular
230/208V 20 Amp
NEMA6-20R

Large tandem
230/208V 30 Amp
NEMA6-30R

265V 15 Amp
NEMA7-15R

265V 20 Amp
NEMA7-20R;

265V 30 Amp
NEMA7-30R;

Sub-bases							
	RAK204U	**RAK204D15P**	**RAK204D20P**	**RAK204D30P**	**RAK204E15**	**RAK204E20**	**RAK204E30**
Voltage	N/A	230/208	230/208	230/208	265	265	265
Amps	N/A	15	20	30	15	20	30
Receptacle	N/A	NEMA6-20R	NEMA6-20R	NEMA6-30R	NEMA7-15R	NEMA7-20R	NEMA7-30R

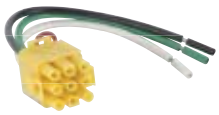
230/208 Volt sub-bases include appropriate power cord kit.
265 Volt units are to be direct connected. Cordset through enclosed chaseway into interior sub-base receptacle meets the NEC requirements.

Power connection kits are required on all Zoneline® chassis (see chart below).

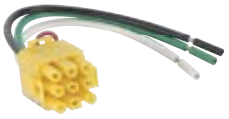
The correct kit for the installation is determined by the voltage and amperage of the electrical circuit and the means of connecting the unit to the building wiring. If the unit is to be plugged into a receptacle, a line cord kit would be used; if the unit is to be permanently connected, a permanent connection kit would be used. 265 volt cord set units must be installed in compliance with National Electrical Code®.

Power connection kits
Required on all models. See specification sheet for heater KW and branch circuit ampacity.

RAK3153/3203/3303
230/208 volt line cord connection kit



RAK4157/4207/4307
230/208 volt universal power supply kit



RAK5157/5207/5307
265 volt universal power supply kit

230/208 volt	Line cord connected units		
LCDI Power Connection Kit	**RAK3153***	**RAK3203***	**RAK3303***
Heater KW	2.4/2.32	3.3/3.2	4.7/4.53
Watts	2,400/2,320	3,300/3,200	4,700/4,530
BTUH	8,150/7,900	11,200/10,900	16,000/15,450
Amps	11.0/11.6	15.1/16.0	21.2/22.4
Min. circuit amps	15	20	30
Recommended protective device	15 amp time delay fuse or breaker	20 amp time delay fuse or breaker	30 amp time delay fuse or breaker

265 volt Permanent connected units** (Cord set)		
RAK5172	**RAK5202**	**RAK5302**
2.4	3.4	4.8
2,400	3,400	4,800
8,150	11,550	16,350
9.6	13.3	18.6
15	20	30
15 amp time delay fuse	20 amp time delay fuse	30 amp time delay fuse

230/208 volt	Direct connection kit†		
	RAK4157	**RAK4207**	**RAK4307**
Heater KW	2.4/2.32	3.3/3.2	4.7/4.53
Watts	2,400/2,320	3,300/3,200	4,700/4,530
BTUH	8,150/7,900	11,200/10,900	16,000/15,450
Amps	11.0/11.6	15.1/16.0	21.2/22.4
Min. circuit amps	15	20	30
Recommended protective device	15 amp time delay fuse or breaker	20 amp time delay fuse or breaker	30 amp time delay fuse or breaker

265 volt Direct connection kit†		
RAK5157	**RAK5207**	**RAK5307**
2.4	3.4	4.8
2,400	3,400	4,800
8,150	11,550	16,350
9.6	13.3	18.6
15	20	30
15 amp time delay fuse	20 amp time delay fuse	30 amp time delay fuse

*RAK3153, RAK3203 and RAK3303 will be transitioning to RAK3153A, RAK3203A and RAK3303A respectively. Old and new models are interchangeable, and there will be no change in performance.
**To be used with sub-base
†To be used with sub-base or connection to building wiring

Preliminary specifications subject to change.

Preliminary Specifications

	Deluxe series – cooling & electric heat				Dry Air 25		
	4100 series units				Dry Air 25		
230/208V Models	**AZ41E07D**	**AZ41E09D**	**AZ41E12D**	**AZ41E15D**	**AZ41E07DAP**	**AZ41E09DAP**	**AZ41E12DAP**
Capacity							
Cooling BTUH	7,300/7,100	9,450/9,250	11,800/11,600	14,700/14,500	6,800/6,600	9,000/8,800	11,200/11,000
EER (BTU/Watt)	12.8/12.8	12.3/12.3	11.8/11.8	10.6/10.6	12.2/12.2	11.8/11.8	11.3/11.3
Dehumidification Pts/Hr	1.7	2.7	3.5	4.6	2.3	3.4	4.4
Features							
Refrigerant type	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
CFM, indoor fan high	290	340	420	409	220	280	330
CFM, indoor fan low	218	229	323	324	190	208	270
Vent CFM (full open/partial open)	50/40	70/45	75/45	75/45	50/40	70/45	75/45
Power/Ratings							
Power factor	89%	93%	93%	90%/92%	86%/87%	92%	92%
Sensible heat ratio @ 230 volts	80%	75%	70%	70%	60%	60%	60%
Watts	570/555	770/755	1000/985	1390/1370	555/540	765/745	995/975
Cooling Amperes, F.L.	2.8/3.0	3.6/3.9	4.7/5.1	6.7/7.2	2.8/3.0	3.6/3.9	4.7/5.1
Amperes, L.R.	19.0	21.0	29.5	31.0	19.0	21.0	29.5
Weight (Net/Ship)	89.5/102.5	99.9/112.9	99.4/112.4	100.3/113.3	97.0/110.0	105.2/118.2	105.4/118.4

265V Models	**AZ41E07E**	**AZ41E09E**	**AZ41E12E**	**AZ41E15E**	**AZ41E07EAP**	**AZ41E09EAP**	**AZ41E12EAP**
Capacity							
Cooling BTUH	7,300	9,450	11,800	14,700	6,800	9,000	11,200
EER (BTU/Watt)	12.8	12.3	11.8	10.6	12.2	11.8	11.3
Dehumidification Pts/Hr	1.7	2.7	3.5	4.6	2.3	3.4	4.4
Features							
CFM, indoor fan high	290	340	420	406	220	280	330
CFM, indoor fan low	215	229	323	324	190	208	270
Vent CFM (full open/partial open)	50/40	70/45	75/45	75/45	50/40	70/45	75/45
Power/Ratings							
Power factor	90%	91%	92%	92%	87%	90%	92%
Sensible heat ratio @ 265 volts	80%	75%	70%	70%	60%	60%	60%
Watts	570	770	1000	1390	555	765	995
Cooling Amperes, F.L.	2.4	3.2	4.1	5.7	2.4	3.2	4.1
Amperes, L.R.	12.0	16.5	23.5	26.0	12.0	16.5	23.5
Weight (Net/Ship)	91.3/104.3	101.2/114.2	99.9/112.9	101.0/114.0	97.4/110.5	104.9/117.9	108.0/121.0

	Deluxe series – heat pump units**			
	6100 series units			
230/208V Models	**AZ61H07D**	**AZ61H09D**	**AZ61H12D**	**AZ61H15D**
Capacity				
Cooling BTUH	7,200/7,000	9,400/9,200	11,800/11,600	14,800/14,600
EER (BTU/Watt)	13.2/13.2	12.7/12.7	12.1/12.1	11.2/11.2
Dehumidification Pts/Hr	1.7	2.7	3.5	4.5
Features				
Refrigerant type	R-410A	R-410A	R-410A	R-410A
CFM, indoor fan high	340	360	370	370
CFM, indoor fan low	194	212	284	290
Vent CFM (full open/partial open)	50/40	70/45	75/45	75/45
Power/Ratings				
Power factor	91%	92%	92%	91%/92%
Sensible heat ratio @ 230 volts	85%	75%	70%	65%
Cooling Watts	545/530	740/725	975/960	1,325/1,305
Cooling Amperes, F.L.	2.6/2.8	3.5/3.8	4.6/5.0	6.3/6.8
Amperes, L.R.	19.0	21.0	29.5	31.0
Reverse cycle heat BTUH	6,400/6,200	8,300/8,100	10,600/10,400	14,000/13,900
COP	4.0/4.0	3.8/3.8	3.7/3.7	3.3/3.3
Heating Watts	470/455	645/630	850/835	1,245/1,235
Heating Amperes	2.2/2.4	3.1/3.3	4.1/4.5	5.8/6.3
Weight (Net/Ship)	94.1/107.1	101.4/114.4	102.1/115.1	100.8/113.8

265V Models	**AZ61H07E**	**AZ61H09E**	**AZ61H12E**	**AZ61H15E**
Capacity				
Cooling BTUH	7,200	9,400	11,800	14,800
EER (BTU/Watt)	13.2	12.7	12.1	11.2
Dehumidification Pts/Hr	1.7	2.7	3.5	4.5
Features				
Refrigerant type	R-410A	R-410A	R-410A	R-410A
CFM, indoor fan high	340	360	370	370
CFM, indoor fan low	194	211	284	290
Vent CFM (full open/partial open)	50/40	70/45	75/45	75/45
Power/Ratings				
Power factor	94%	90%	92%	93%
Sensible heat ratio @ 265 volts	85%	75%	70%	65%
Cooling Watts	545	740	975	1,325
Cooling Amperes, F.L.	2.2	3.1	4.0	5.4
Amperes, L.R.	12.0	16.5	23.5	26.0
Reverse cycle heat BTUH	6,400	8,300	10,600	14,000
COP	4.0	3.8	3.7	3.3
Heating Watts	470	645	850	1,245
Heating Amperes	2.0	2.7	3.6	5.0
Weight (Net/Ship)*	94.6/107.6	103.6/116.6	103.6/116.6	104.3/117.3

*ICR adds 3 pounds to unit weight

**Corrosion model BTUH and watts may vary.

Preliminary specifications subject to change.

Complete Accessory List

Kit Number	Description	For Additional Information Refer to Page
RAA63	Spare Filters for AZ2900, AZ3900, AZ4100, AZ5800 and AZ6100 Series units	11
RAB71A	Steel Wall Case – 13-3/4" deep	22
RAB7116	Steel Wall Case – 16" deep	22
RAB7124	Steel Wall Case – 24" deep	22
RAB7128	Steel Wall Case – 28" deep	22
RAB7131	Steel Wall Case – 31" deep	22
RAB77	Molded Wall Case	22
RAD10	Interior/Exterior Drain kit	35
RAF453	Room Front for AZ4100 and AZ6100 Series units (included with chassis)	11
RAG60	Stamped Aluminum Exterior Grille	40
RAG61	Architectural Exterior Grille, Beige Molded High-Impact Plastic	40
RAG62	Architectural Exterior Grille, Maple Molded High-Impact Plastic	40
RAG63	Architectural Exterior Grille, Bittersweet Chocolate Molded High-Impact Plastic	40
RAG67	Aluminum Architectural Grille (Custom Colors Available by Special Order)	40
RAK40	Condenser Air Deflector Kit	40
RAK148D1	Wall Thermostat For Heat Pump Models - Electronic Digital	16
RAK148P1	Wall Thermostat For Heat Pump Models – Electronic Digital Programmable	16
RAK164D1	Wall Thermostat For Resistance Heat Models – Electronic Digital	15
RAK164P1	Wall Thermostat For Resistance Heat Models – Electronic Digital Programmable	15
RAK201	Sub-Base Cover Plate with Knockouts	43
RAK204D15P	Sub-Base - 208/230-Volt with NEMA 6-20R 15/20 Amp Receptacle – Power Cord and Chaseway included	22
RAK204D20P	Sub-Base - 208/230-Volt with NEMA 6-20R 15/20 Amp Receptacle – Power Cord and Chaseway included	22
RAK204D30P	Sub-Base - 208/230-Volt with NEMA 6-30R 30 Amp Receptacle –Power Cord and Chaseway included	23
RAK204E15	Sub-Base – 265-Volt with NEMA 7-15R 15 Amp Receptacle – Chaseway included	23
RAK204E20	Sub-Base – 265-Volt with NEMA 7-20R 20 Amp Receptacle – Chaseway included	23
RAK204E30	Sub-Base – 265-Volt with NEMA 7-30R 30 Amp Receptacle – Chaseway included	23
RAK204U	Sub-Base – non-electrical Chaseway not included	22
RAK205CW	Chaseway for Sub-Base	22
RAK3153A	Universal Power Cord – 4100/6100 series – 15-Amp 230/208 V – 2.40/2.32 kW heat	42
RAK3203A	Universal Power Cord – 4100/6100 – 20-Amp 230/208 V – 3.3/3.2 kW heat	42
RAK3303A	Universal Power Cord – 4100/6100 – 30-Amp 230/208 V – 4.7/4.53 kW heat	42
RAK4002A	Direct-Connect Junction Box – 230/208-volt units 4100/6100 Series	42
RAK4002B	Direct-Connect Junction Box – 230/208-volt units 5800 Series	42
RAK4002CW	Wiring Harness w/Inline Connector - Adapt Line Cord to Direct Connection	43
RAK4157	208/230V Universal Power Supply, 15 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK4207	208/230V Universal Power Supply, 20 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK4307	208/230V Universal Power Supply, 30 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK5157	265V Universal Power Supply, 15 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK5207	265V Universal Power Supply, 20 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK5307	265V Universal Power Supply, 30 Amp for 2800, 2900, 3800, 3900, 4100, 5500, 5800, 6100, 7500 and 8500 only	42
RAK5172	Universal Connection Kit – 265V – 15 Amp – Use w/RAK204E15 Sub-Base – 2.40 kW heat	42
RAK5202	Universal Connection Kit – 265V – 20 Amp – Use w/RAK204E20 Sub-Base – 3.40 kW heat	42
RAK5302	Universal Connection Kit – 265V – 30 Amp – Use w/RAK204E30 Sub-Base – 4.80 kW heat	42
RAK601	Duct Extension – Insulated – 44" long – includes Register and Trim Flange	37
RAK602	Register and Trim Flange (Included with RAK601)	37
RAK6052	Duct Adapter for New Installation (or older non-GE duct adapter installation)	37
RAK7012	Duct Adapter for replacement of A-B with rounded-front AZ chassis for 2200, 3200, 2500, 3500, 2800, 2900, 3800, 3900, 4100 and 6100 only	37
RAK7022	Duct Transition for replacement of AZC with rounded-front AZ chassis for 2200, 3200, 2500, 3500, 2800, 2900, 3800, 3900, 4100 and 6100 only	37
RAK8023	Locking Door Kit	11
RAK806	Control Panel Cover (for use with remote thermostat)	15
RAK901L	Wall Case Insulation Kit	22

General Installation Suggestions

Many times poor or non-existent caulking around the exterior of the wall case results in air infiltration, causing the unit to run excessively. One way to check for air infiltration is to look under and around the unit to the outdoors. If you can see light, there is air infiltration. The first floor of a building is where this problem most frequently occurs since caulking the bottom of the wall case may require lying outside in the dirt while working. This has been the cause of many complaints about the "short cycling" of the unit.

Curtains, furniture or other obstructions interfering with the discharge air circulation will make the unit cycle/turn off too soon since the cooled (or heated) discharge air is pulled back into the unit. This results in a room that is not adequately heated or cooled.

Blocking the discharge air on the unit during the heating operation can result in the air getting hot enough to distort the plastic room front. If you have a property where this may occur we recommend a "tent card" advising room occupants not to put anything on the unit.

Electrical Wiring Installation

Do not allow the installer to drill a hole in the wall case to run the electrical wiring. If this is done, the wiring will have to be run between the chassis and the edge of the wall case so it can be connected to the unit wiring on the room side of the wall case. When the chassis is removed for servicing or cleaning, the insulation on the wires can be cut and can create a safety hazard.

If the electrical connection on a 230-volt or 208-volt installation is to be made by the line cord plugged into a wall-mounted receptacle, the receptacle should be located in the wall under the case or close to the side of the wall case. This installation makes a much neater appearance than a line cord running a foot or more across the floor. The electrician may want to place the receptacle as far from the unit as possible to save a few feet of wiring without considering how the installation may appear.

Central Desk Control and Remote Thermostat Wiring

Do not allow the installer to drill a hole in the wall case to run Central Desk Control wiring or remote thermostat wiring to the unit terminals. CDC and remote thermostat wiring is classified as low-voltage wiring and does not have to be run in conduit unless required by local code. CDC and remote thermostat wiring should be run in the walls and exit the wall under the wall case about 2" from the right-hand side. The base pan is designed with a clearance for the line cord and the low-voltage wiring can also be run to the chassis in this area. Wire molding can be used to hold the wiring close to the bottom of the wall case. If a sub-base is used, the wiring can be run through the sub-base, entering the rear and exiting through one of the front panels. When the room cabinet is in place the CDC or remote thermostat wiring is usually not visible to someone standing or sitting in the room. Do not run the low-voltage wiring in conduits with line-voltage wiring or near uninsulated line-voltage wiring since induced current can interrupt the low-voltage controls.

Consult the electrical inspector early in the project, especially if the power to the air conditioner is to be 265 volts, to understand what is required to comply with local electrical codes.

Wall Case/Exterior Grille

When making an installation where the exterior grille is flush with the exterior wall, or part of a custom window/louver section, make sure the installer caulks the wall case to the exterior wall, especially the bottom of the case. Many times the air conditioners are run during construction and the building is not closed. This can result in excessive humidity from the warm humid air entering the building, or from the "drying out" of the building materials. Many problems have been caused by condensate water or rainwater running back into the building where proper caulking has not been done.

Capacity Considerations

A unit that has a greater cooling capacity than required will cool the room quickly but will usually not run long enough under normal operation to adequately dehumidify the room. Most musty odors in rooms are due to excess humidity. Using a smaller-capacity unit or using Dry Air 25 units will provide better dehumidification. The largest factor in causing mold and mildew in the room is excess moisture. A smaller unit running longer or a Dry Air 25 model can remove more moisture. Mold behind wall coverings that do not allow water vapor to pass through—vinyl wallpaper or oil-base paints, for example—is not a problem of excessive moisture in the room, but rather is caused by moisture trapped in the walls.

Using a resistance heater larger than required—using a 4.7 kW heater when a 3.3 kW heater would suffice for example —may not cost any more in electrical consumption since the larger heater will operate for less time. The "Demand Charge" portion of the utility bill—which is based on the highest electrical load for a period of time—may be a significant portion of the utility bill. Some customers have reported the demand charge actually being more than the usage charge. In a 100-room property it would be possible for the demand of the 4.7 kW heater versus a 3.3 kW heater to be 140 kW more than the demand charge if the lower wattage heaters were used. Working with the utility companies to understand their method of billing and taking advantage of any rebates they may offer can reduce the utility bill.

Exterior Grilles

When replacing an older unit, the existing outdoor grille may need to be changed or modified. Outdoor airflow patterns have changed and this may dictate the need for outdoor grille replacement or modification.

General Installation Suggestions

Ducted Installation Comments

New Installations

The GE Zoneline® 4100 and 6100 Series are approved for ducted installation using the GE Duct Adapter model RAK6052 and the GE Duct Extension RAK601. A field-fabricated duct extension with the same interior measurements as the RAK601 may be used with the RAK6052 duct adapter. GE does not recommend ducting in more than one direction.

The use of a duct adapter other than the RAK6052 is not approved by GE and may cause problems such as inadequate airflow to the secondary room or the unit shutting off on one of the overload devices.

Failure to allow for adequate air return from the secondary room is often the cause of less than satisfactory performance of a ducted installation.

Replacement Installations

GE offers duct adapters to allow for easy replacements of previous-design chassis in ducted installations where a GE duct adapter was used in the original installation. A duct adapter is available that will align with the duct extension when GE-built components were used in the original installation.

The duct adaptor/extension used from the early 1960s until late 1987 was 8-3/8" high by 6-1/2" wide. If the chassis to be replaced is the flat-top discharge (design until late 1987) the duct adapter model RAK7012 will align with the existing duct extension. This means the duct extension will not have to be changed. However, to keep the cost of the replacement to a minimum there are components that will need to be taken off the existing installation and used on the RAK7012 duct adapter. The wall case mounting brackets, screws, discharge grille, damper and end cap will need to be retained.

If the chassis is a slope-front discharge and the duct dimensions are 8-3/8" high by 6-1/2" wide, then the chassis has already been replaced and the purchase of a new duct adapter is not required. The only piece that needs to be replaced in this installation is the transition piece, model RAK7022, which fits between the chassis and the duct adapter.

If the chassis being replaced has a model number that begins with AZ22, AZ25, AZ28, AZ29, AZ32, AZ35, AZ38 or AZ39, the new 4100 or 6100 Series unit can be installed using the same duct components.

If the existing chassis is a slope-front discharge and the duct dimensions are 7-3/32" high by 6-1/2" wide, only the RAK7022 transition piece is required to install a 4100 or 6100 Series unit in the ducted installation.

There were a number of Zoneline units installed in ducted installations that did not use a GE duct adapter. The easiest way to determine if the existing duct adapter is a GE duct adapter is to compare the duct adapter dimensions to the dimensions above. If the dimensions are different from the dimensions above or it the duct adapter is not made of sheet metal, it is not a GE duct adapter. In such installations GE recommends the removal of the old duct adapter and duct extension and the installation of a RAK6052 duct adapter and a RAK601 duct extension. Zoneline units installed in installations not using GE duct adapters and an extension with the same cross-section dimensions as the duct adapter may not be covered by the warranty.

Zoneline Warranty*

What is covered

Limited one-year warranty
For one year from the date of the original purchase, GE will repair or replace any part of the air conditioner which fails due to a defect in materials or workmanship. During this limited one-year warranty, GE will provide, free of charge, all labor and related service costs to repair or replace the defective part.

Limited five-year warranty
For five years from the date of the original purchase, GE will repair or replace the Sealed Refrigerating System if any part of the Sealed Refrigerating System (the compressor, condenser, evaporator, and all connecting tubing) should fail due to a defect in materials or workmanship. During this limited five-year warranty, GE will provide, free of charge, all labor and related service costs to repair or replace the defective part.

Limited second-through-fifth-year parts warranty
From the second through the fifth year from the date of the original purchase, GE will replace the Fan Motors, Switches, Thermostat, Heater, Heater Protectors, Compressor Overload, Solenoids, Circuit Boards, Auxiliary Controls, Thermistors, Freeze Sentinel™, Frost Controls, ICR Pump, Capacitors, Varistors and Indoor Blower Bearing, if any of these parts should fail due to a defect in materials or workmanship. During this additional four-year limited warranty, you will be responsible for any labor and related service costs.

*See written warranty for details

Notes

Notes

Alphabetical Index

Exterior Grille Color Samples

Beige

Maple

Bittersweet

Colors may vary slightly due to printing process.

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For more than a century, GE has been committed to producing innovative products that change the way people live. The result of thorough research and rigorous testing, GE appliances are designed for years of dependable performance.
Today, the GE tradition of quality and innovation continues.

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zoneline.com

Before purchasing an appliance, read important information about its estimated annual energy consumption or energy efficiency rating that is available from your retailer or geappliances.com.

GE has a policy of continuous improvement of its products and reserves the right to change materials and specifications without notice.

Pub. No. 20-S080 PC60486