

# SMART-R™ Wall Solution



An Integrated System  
with Details that Make a Difference



**CENTRIA**

REIMAGINING THE BUILDING ENVELOPE

# The SMART-R™ Wall Solution

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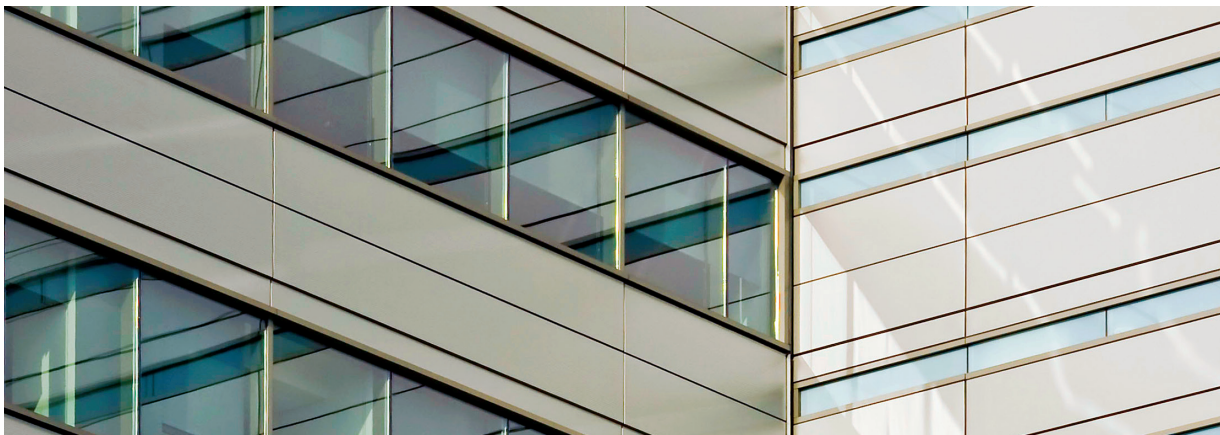
CENTRIA's Smart-R Wall Solution offers the ultimate combination of aesthetics and sustainability, along with the best metal wall thermal performance on the market today. CENTRIA's team of design and development experts have created innovative components and integrated solutions that combine wall panels, windows, louvers and sunshades for outstanding thermal efficiency. Plus, Smart-R utilizes CENTRIA's proprietary Advanced Thermal and Moisture Protection (ATMP®) technology that involves installing our factory-foam insulated metal panels outboard of the building's metal studs.

Another key benefit of the Smart-R Wall Solution is the way the system addresses air infiltration - a critical issue in overall wall performance. All-metal joinery provides unrivaled architectural panel aesthetics. The factory-assembled Formavue-600 window frames further enhance the system's thermal performance since they are specifically designed to work with the Formawall panel. Finally, the Smart-R Wall is a sustainable solution, providing improved thermal performance, minimizing the number of materials used to build the wall, as well as reducing jobsite waste.

The Smart-R Wall Solution

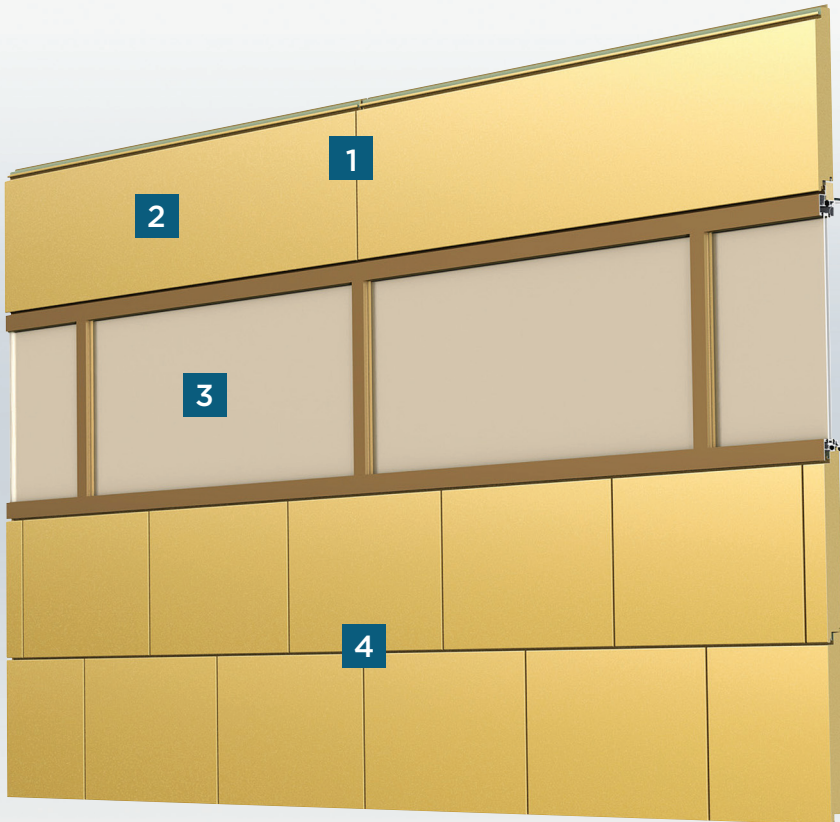
## Maximizes Thermal Efficiency

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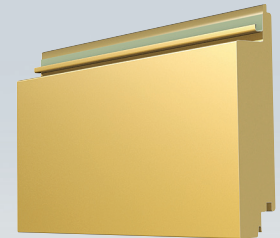


# SMART-R™ Wall Solution

Introducing CENTRIA's most efficient and aesthetic approach to metal wall systems. Smart-R combines seamless integration of panels, windows, louvers and sunshades with enhanced thermal performance to deliver an unmatched combination of aesthetics, performance and sustainability.



1 Formawall IMV



2 3" FWDS-T



3 Formavue 600



4 3" FWGS-T

## FEATURES & BENEFITS

### DESIGN

- Systems approach to high-performance architectural cladding
- Seamless integration of panels, windows, louvers and sunshades provides sleek sightlines at component joinery intersections
- All-metal joinery provides unrivaled architectural foam panel aesthetics
- Design flexibility with 3" [76mm] thick Formawall Dimension Series DS-59 and DS-60 profiles and Formawall Graphix Series panels

### PERFORMANCE

- Improved 3" [76mm] FWDS-T panel and new FV-600 window thermal performance
- Addresses air infiltration, a critical issue in overall wall performance
- Formawall IMV metal vertical

joint features improved thermal performance and superior defense against water intrusion

- Shop-assembled windows reduce risk during field installation and increase the speed of construction

### SUSTAINABILITY

- Integrated wall system reduces the amount of material used (no receptors or exposed sealants)
- Engineered composite foam panel, integrated accessories and factory-assembled windows reduce job site waste
- High-performance wall system improves the overall air, water and thermal performance

# Why Thermal Performance Matters

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Thermal performance is an important indicator of a building's overall energy efficiency.

When measuring energy efficiency, two key factors need to be considered: heat loss and condensation. One of the most effective ways to reduce heat loss and minimize condensation is to focus on wall system interface details like panel joints, extrusions and windows – locations that typically exhibit higher heat flow.

CENTRIA's Smart-R Wall Solution effectively deals with both of these issues by identifying and improving key wall system components, including joinery, extrusions and windows. The Smart-R Wall Solution offers an integrated wall solution with thermally enhanced details for improved overall thermal performance.

When maximum thermal efficiency is an important project goal, reimagine thermal performance by specifying the Smart-R Wall Solution, the most efficient, integrated 3" metal panel and window system on the market today.





**CENTRIA**

REIMAGINING THE BUILDING ENVELOPE

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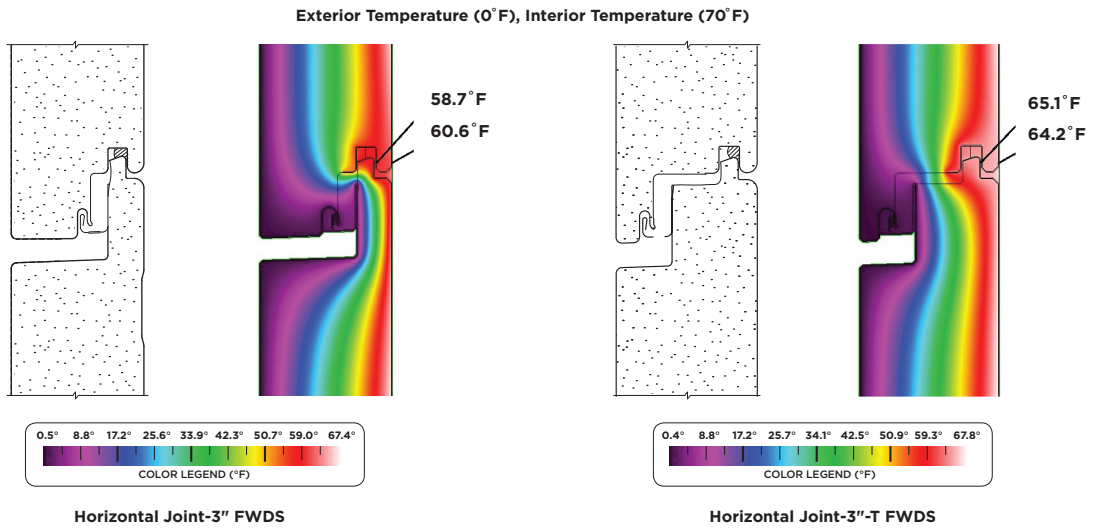
Reference SRF 11/11 5M PG/GCS Copyright ©2011 CENTRIA

An effective overall wall system starts by identifying the key components of the wall and designing them for maximum efficiency. CENTRIA's expertise in Advanced Thermal and Moisture Protection (ATMP®) led to innovative improvements in the most critical areas of the wall system—the details—which include the panel joinery and panel extrusions.

One of the most likely places in a wall where heat can escape and condensation can occur is at the wall system transition details. The Smart-R Wall Solution addresses this problem by using the Formawall® Dimension Series® (FWDS) 3"-T panel. The 3"-T panel offers innovative design options with a wide range of reveal and joint configurations, along with a thermally enhanced 3" thick insulated metal panel. This thermally enhanced panel joinery reduces heat loss through the vertical and horizontal joint because of the separation of the inner and outer metal facers.

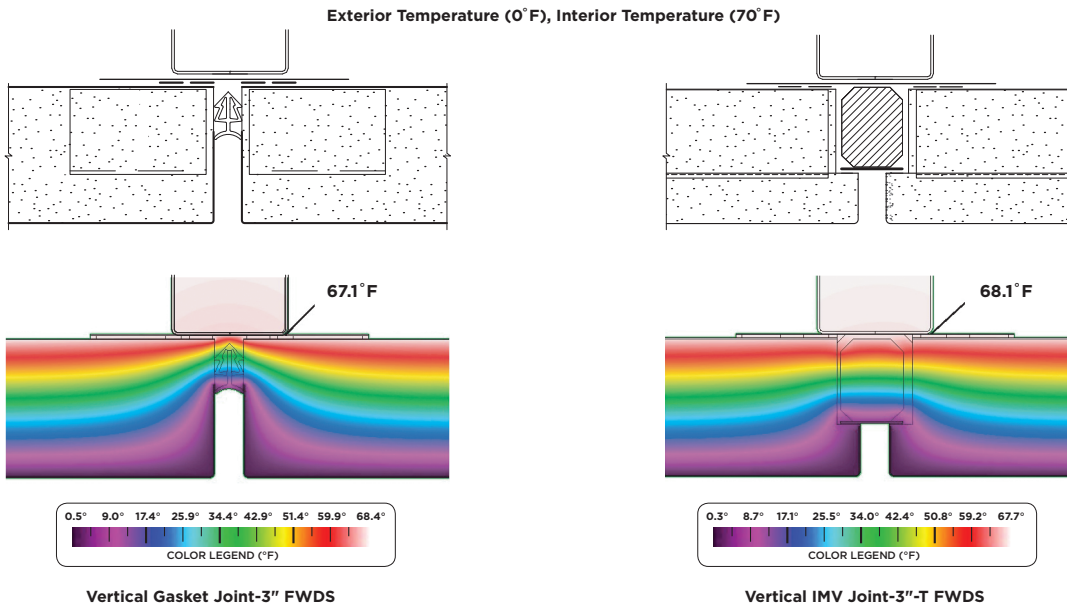
**FIGURE 1.**

Thermographs showing temperature distribution through the horizontal joint detail with 3" and 3"-T FWDS panels.



**FIGURE 2.**

Thermographs showing temperature distribution through the vertical gasket joint with 3" and Insulated Metal Vertical (IMV) joint with 3"-T FWDS panels.

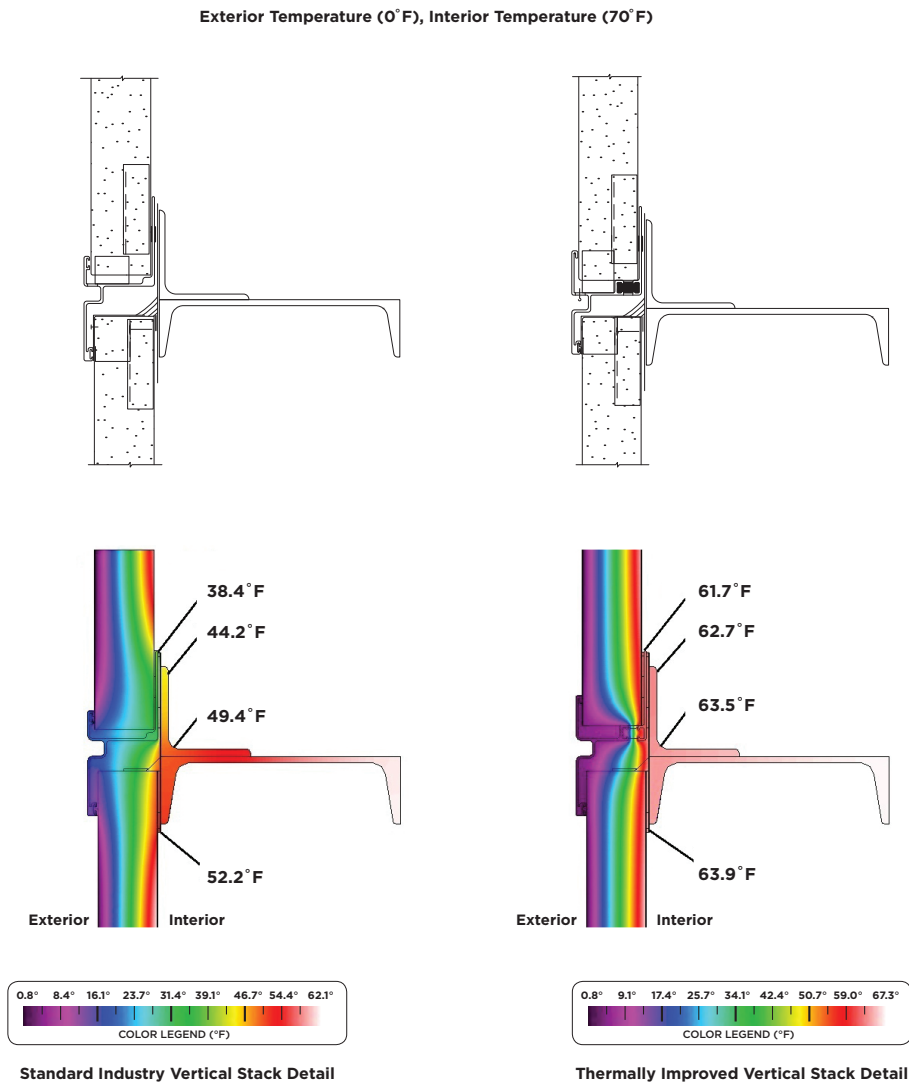


# SMART-R™ Components

CENTRIA's team of building science experts have also developed thermally enhanced panel extrusions incorporating CENTRIA's ATMP technology. The extrusions are strategically located at panel deflection joints and at panel heads, sills and jambs of openings. The positive end result is that both heat loss and the risk for condensation are reduced.

**FIGURE 3**

Thermographs showing temperature distribution for the standard industry vertical stack detail with non-thermally broken extrusion and CENTRIA's thermally enhanced stack detail.



CENTRIA's comprehensive approach to wall design provides the products and technical expertise necessary for building Smart-R walls. Efficient panels with high R-values are combined with thermally efficient components, including vertical and horizontal joints and perimeter extrusions, for maximizing overall wall performance.

**NOTE:** The analysis and annotated thermographs in this document were generated using THERM 6.3, two-dimensional heat transfer analysis software developed at Lawrence Berkeley National Laboratory (LBNL). The analysis measured heat loss through a 16" wide strip of the condition noted. These analyses do not account for heat transfer due to air leakage across the building enclosure or solar heat gain through the windows. The analysis was conducted with 70 deg F indoor and 0 deg F outdoor wintertime temperatures.

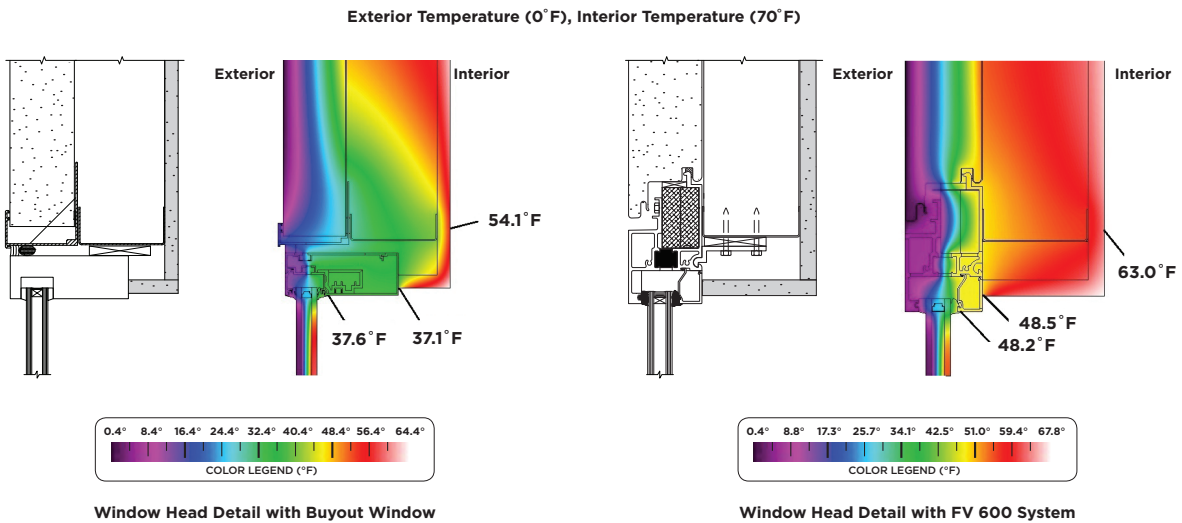


While the overall wall system design is an important factor in a building's overall thermal performance, it is the building details that are most critical. In fact, windows may account for up to 40% of a building's enclosure per the prescriptive building envelope energy compliance path in the ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) Standard 90.1 (2010). This means there can be hundreds of feet of window perimeter details (conditions) not optimized for thermal performance — specifically panel-to-window transitions at the head, sill, and jamb. When the walls and windows are not engineered to work together properly, the result is increased heat loss or risk of condensation, impacting thermal performance and creating an environment for mold or corrosion to occur.

A key to the industry-leading performance of the Smart-R Wall Solution is the integrated detailing at window openings. CENTRIA's Formavue 600 (FV 600) shop assembled window frame system offers integrated head, sill and jamb details that feature large thermal breaks aligned with the panel insulation, as well as additional insulation in the head of the window frame.

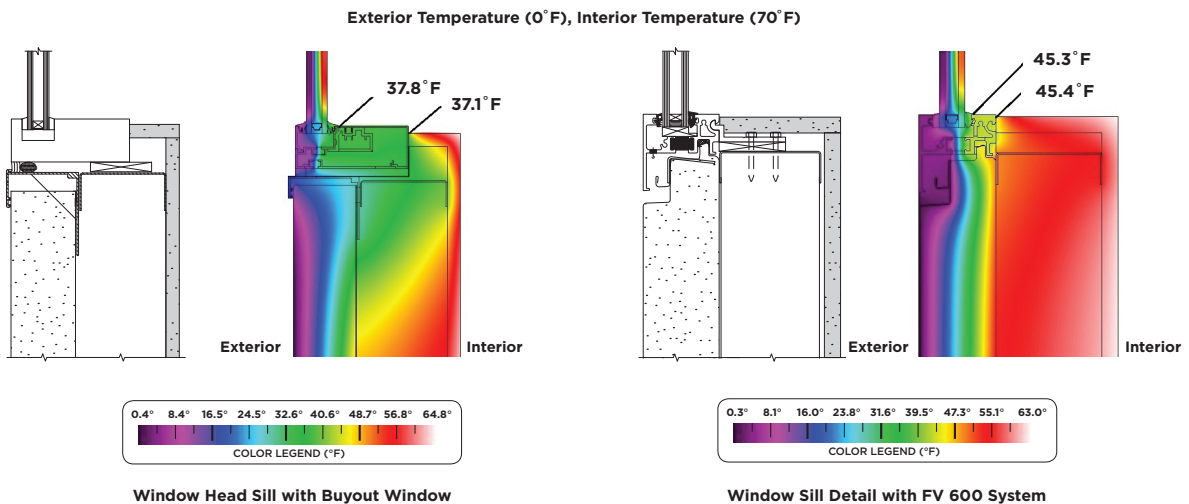
**FIGURE 1**

Thermographs for standard industry head detail with buyout window and CENTRIA's 3"-T Formawall Dimension Series (FWDS) panel with FV 600 window systems.



**FIGURE 2**

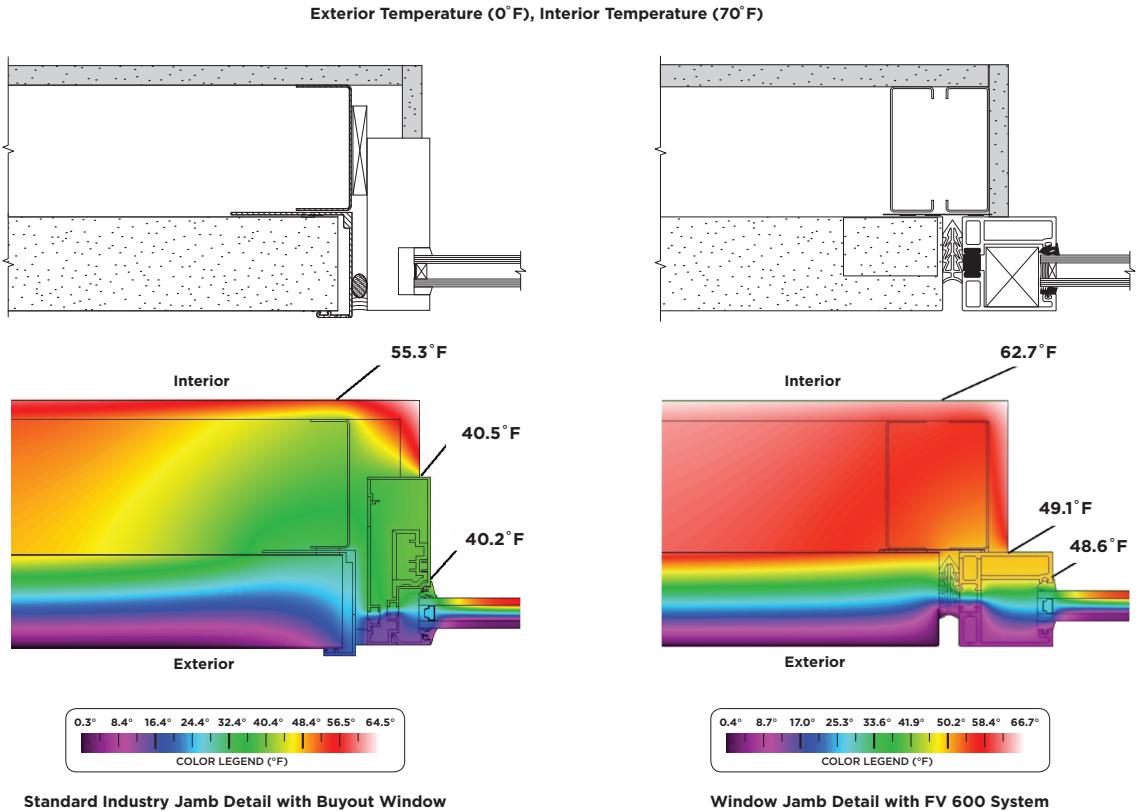
Thermographs for standard industry sill detail with buyout window and CENTRIA's 3"-T FWDS panel with FV 600 window systems.



# SMART-R™ Integration

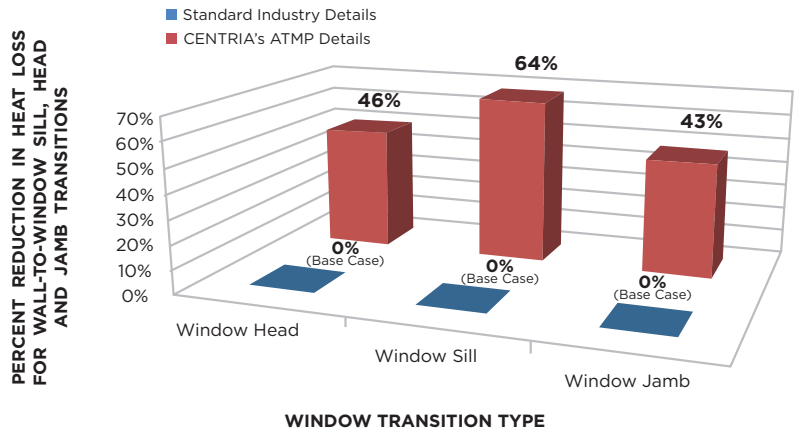
**FIGURE 3**

Thermographs for standard industry jamb detail with buyout window and CENTRIA's 3"-T FWDS panel with FV 600 window systems.



**FIGURE 4**

Comparison of standard industry wall-to-window transition details and CENTRIA details.



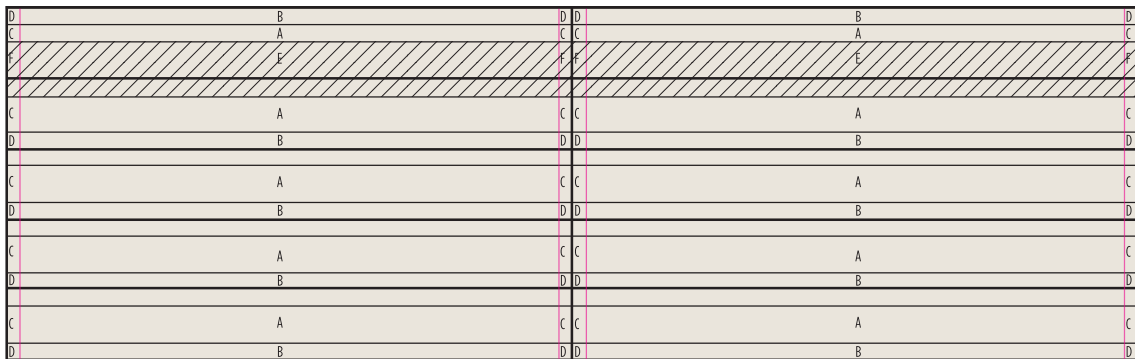
CENTRIA's comprehensive approach to wall design provides the products and expertise for building Smart-R walls. The overall performance and efficiency of the wall system are significantly enhanced when integrated components that include thermally enhanced details like the Smart-R Wall Solution's FV 600 window are part of the project specification.

**NOTE:** The analysis and annotated thermographs in this document were generated using THERM 6.3, two-dimensional heat transfer analysis software developed at Lawrence Berkeley National Laboratory (LBNL). The analysis measured heat loss through a 16" wide strip of the condition noted. These analyses do not account for heat transfer due to air leakage across the building enclosure or solar heat gain through the windows. The analysis was conducted with 70 deg F indoor and 0 deg F outdoor wintertime temperatures.

CENTRIA's expertise in Advanced Thermal and Moisture Protection (ATMP®) has led to the development of thermally enhanced, integrated details including deflection joints. These deflection joints are important because they occur along the building perimeter and likely on every floor, accounting for a significant amount of surface area where heat can escape. This heat loss is particularly likely with projects that are designed with the studs inset from the slab edge. If standard industry joints are used, significant heat loss is likely. CENTRIA's deflection joints provide a thermally broken extrusion with materials that inhibit heat flow along with a block of rigid insulation aligned with the thermal break in the extrusion. The result is an 80% reduction in heat loss compared to a standard industry deflection joint without thermal improvements.

**FIGURE 1**

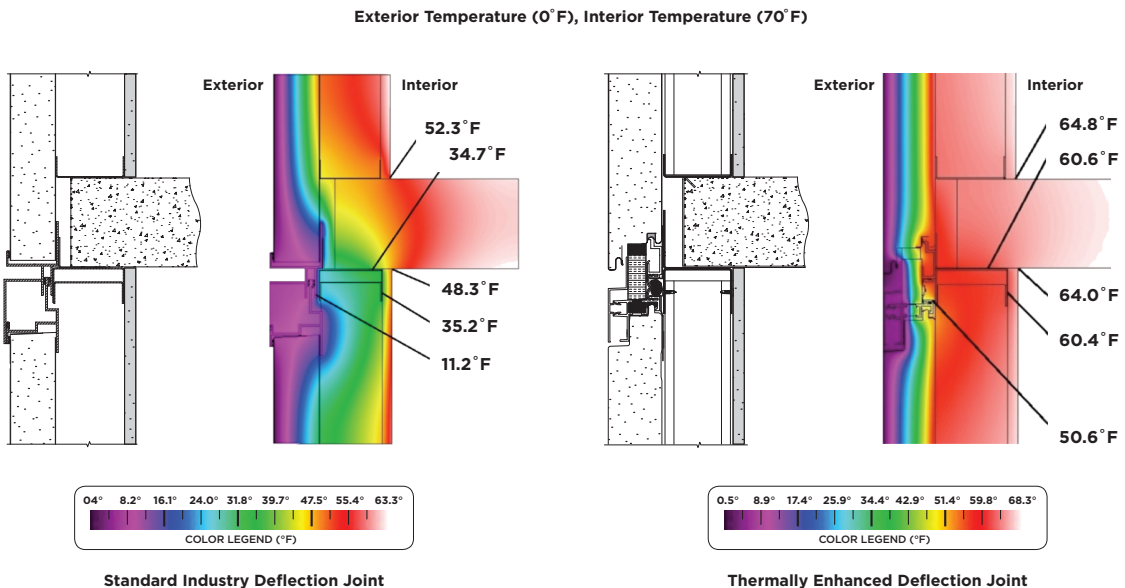
Schematic of 500 ft<sup>2</sup> wall with deflection joint and corresponding influence areas used in the analysis.



- A** Center of Panel
- B** Horizontal Panel Joint
- C** Vertical Panel Joint
- D** Horizontal-to-Vertical Joint Transition
- E** Deflection Joint
- F** Deflection-to-Vertical Joint Transition

**FIGURE 2**

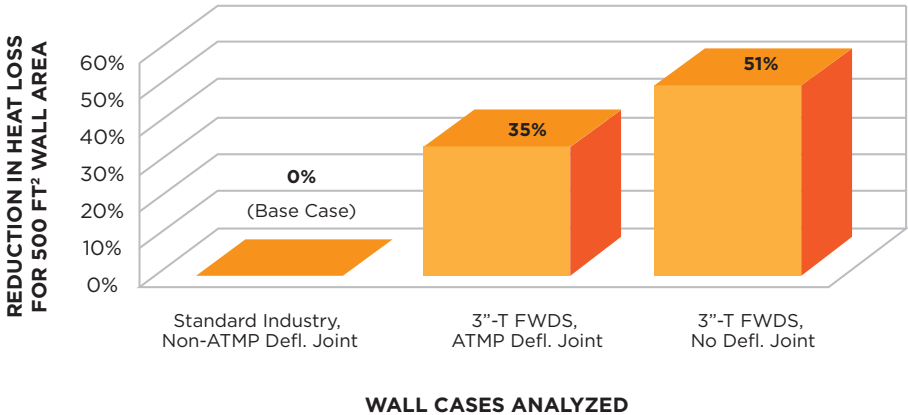
Thermographs showing temperature distribution through a standard industry deflection joint detail with non-thermally broken extrusion and CENTRIA's thermally enhanced deflection joint.



# SMART-R™ Detailing

With multi-floor buildings, the most effective approach is to use steel thru-tube support systems in the early stages of the project to reduce or eliminate the deflection joints, which is the best way to improve the thermal performance of the wall. However, if allowance for deflection is provided on each floor, the Smart-R Wall Solution's ATMP deflection joint provides superior thermal performance and minimizes the localized thermal bridging that can cause condensation—and eliminates the problems associated with it.

**FIGURE 3**  
**Deflection joint impact on whole wall performance:** Comparison of standard industry deflection joint with non-thermally broken extrusion and CENTRIA's 3"-T Formawall Dimension Series (FWDS) panels with a thermally enhanced deflection joint, and a wall with no deflection joint.



**Base Case:** Standard industry 3" thick Insulated Metal Panel (IMP) and non-thermally broken deflection joint details

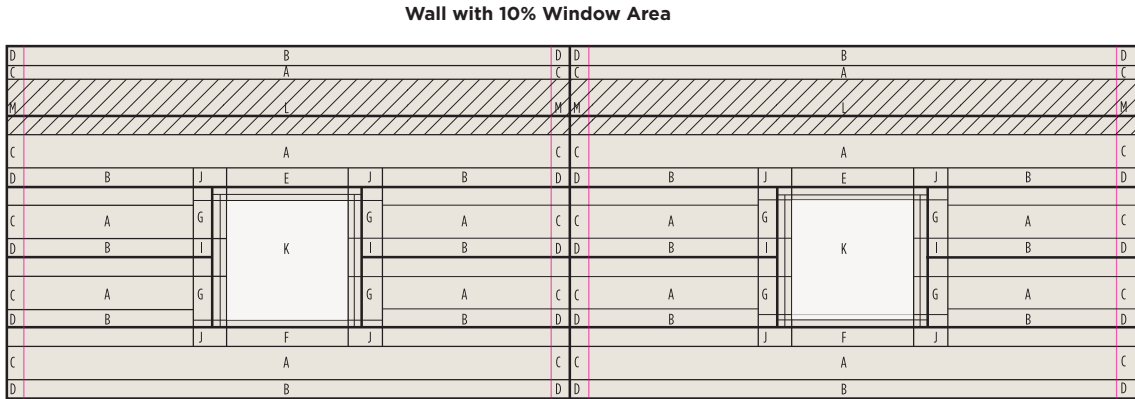
CENTRIA's comprehensive approach to wall design provides the products and expertise for building Smart-R walls. Reducing the impact of deflection joints should be a goal of projects and requires coordination between the designer, the engineer and the product manufacturer.

**NOTE:** The analysis and annotated thermographs in this document were generated using THERM 6.3, two-dimensional heat transfer analysis software developed at Lawrence Berkley National Laboratory (LBNL). The analysis measured heat loss through a 16" wide strip of the condition noted. These analyses do not account for heat transfer due to air leakage across the building enclosure or solar heat gain through the windows. The analysis was conducted with 70 deg F indoor and 0 deg F outdoor wintertime temperatures.

The effective thermal performance of a building envelope goes beyond the panel—it includes the impact of window, window transition, panel joinery and other details such as deflection joints and perimeter conditions. The analysis below illustrates the improvement in thermal efficiency of 500 ft<sup>2</sup> of a Smart-R Wall Solution with CENTRIA's Advanced Thermal Moisture Protection (ATMP®), thermally optimized details compared to a standard wall assembly. Specifically, the details being analyzed include horizontal and vertical panel joinery, panel-to-window head, sill and jamb transitions, vertical mullions and deflection joints.

**FIGURE 1**

Schematic of 500 ft<sup>2</sup> wall area with details and corresponding influence areas used in the analysis.



- A** Center Panel
- B** Horizontal Panel Joint
- C** Vertical Panel Joint
- D** Horizontal-to-Vertical Joint Transition
- E** Panel-to-Metal Head Transition
- F** Panel-to-Window Sill Transition
- G** Panel-to-Window Jamb Transition
- H** Vertical Mullion (Not shown. Included only for 20%, 30%, and 40% window area)
- I** Horizontal Panel Joint-to-Window Jamb Transition
- J** Horizontal Panel Joint at Window Corner
- K** Glass
- L** Deflection Joint
- M** Deflection-to-Vertical Joint Transition

**TABLE 1**

Summary of parameters used in the above wall analysis.

Insulated Metal Panel (IMP)	Percent Window Area [%]	Window Perimeter Detail	Vertical Joint	Deflection Joint
Standard Industry 3"	30	Standard Industry <sup>+</sup>	Gasket	Standard Industry <sup>++</sup>
	20			
	10			
3"-T FWDS	30	FV 600	Insulated Metal Vertical (IMV)	ATMP
	20			
	10			

<sup>+</sup>Thermally broken aluminum extrusion.

<sup>++</sup>Non-thermally broken aluminum extrusion.

# SMART-R™ Solutions

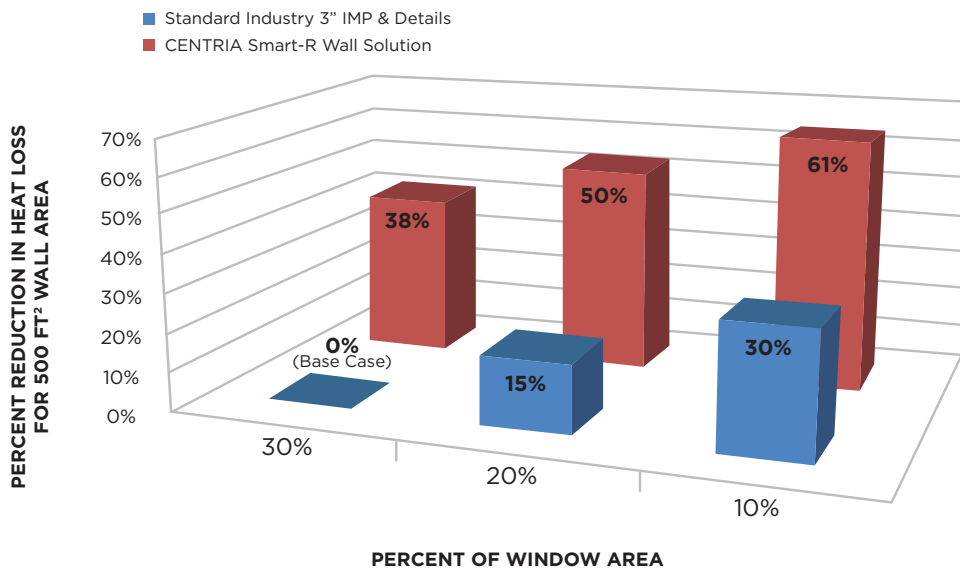
The results are significant—for a wall with a 30% glazed area, a 38% reduction in heat loss is noted when 3"-T Formawall Dimension Series (FWDS), Formavue 600 (FV 600) windows and thermally enhanced details are implemented instead of industry standard three-inch panels, buyout windows and non-thermally improved extrusions.

CENTRIA's comprehensive approach to wall design provides the products and expertise for building smarter walls. During the design phase of a project, specifying wall systems with thermally enhanced components, including vertical and horizontal joints, as well as perimeter extrusions like the Smart-R Wall Solution's 3"-T panel, FV 600 window and ATMP extrusions, is a great way to improve a building's overall thermal efficiency. With multi-floor buildings, if an allowance for deflection is needed on each floor, the Smart-R Wall Solution's ATMP deflection joint provides superior thermal performance when compared to non-thermally broken deflection joints.

CENTRIA's outstanding design, development and technology makes the Smart-R Wall Solution the most energy efficient 3" thick insulated metal panel and aluminum window system available on the market today.

**FIGURE 2**

Reduction in heat loss for wall with Smart-R Wall Solution compared to 3" IMP with standard industry details.



## Standard Industry

- 3" IMP
- Gasketed vertical joint
- Thermally broken aluminum window with thermally broken receptor system
- Non-thermally broken panel extrusions
- Non-thermally broken deflection joint

## Smart-R Wall

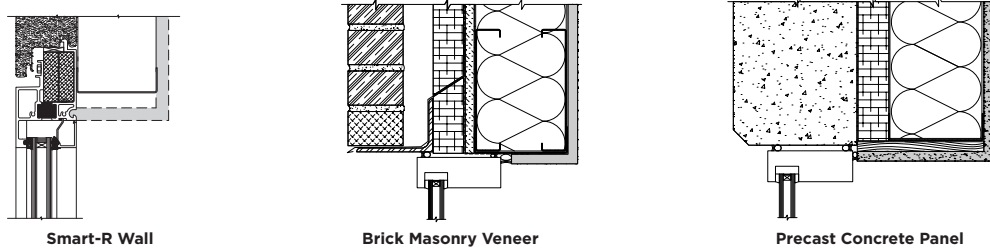
- 3"-T FWDS
- FWDS Insulated Metal Vertical Joint (IMV)
- FV 600 Window
- ATMP Panel Extrusions
- ATMP Deflection Joint

**NOTE:** The analysis and annotated thermographs in this document were generated using THERM 6.3, two-dimensional heat transfer analysis software developed at Lawrence Berkley National Laboratory (LBNL). These analyses do not account for heat transfer due to air leakage across the building enclosure or solar heat gain through the windows. The analysis was conducted with 70 deg F indoor and 0 deg F outdoor wintertime temperatures.

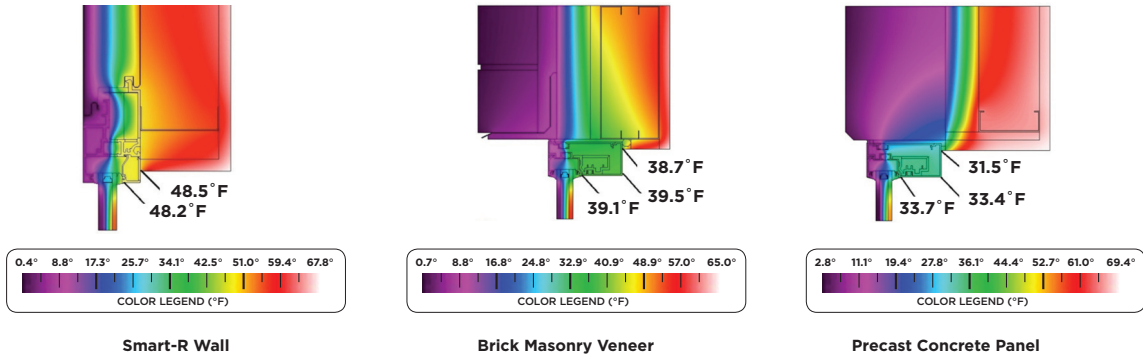
The thermal performance of a wall is affected by the performance of the components that make up the wall system as well as the transition details between windows and walls, the percentage of windows, and other details such as deflection joints (in metal panel systems), metal shelf angles (in brick masonry veneer systems), and slab edge conditions (in architectural precast concrete systems).

The thermographs below show the temperature distribution through the head and sill conditions of a standard industry buyout window with brick masonry and architectural precast compared to a CENTRIA Smart-R Wall Solution.

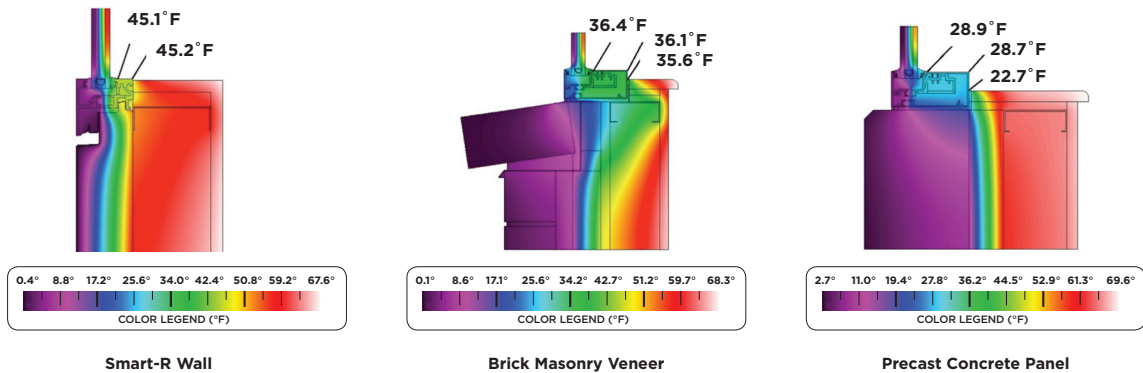
**FIGURE 1**  
Window head details.



**FIGURE 2**  
Cladding to window head transitions.



**FIGURE 3**  
Cladding to window sill conditions.



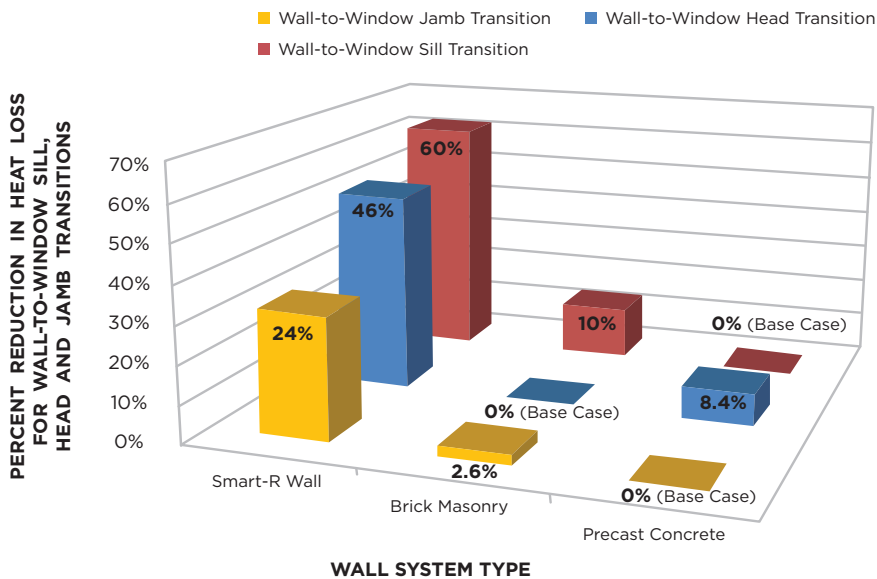
CENTRIA's Smart-R Wall Solution offers significant improvements in thermal efficiency over that of brick and precast by offering insulation exterior of the building cavity as well as thermally improved and integrated wall-to-window transition details.

# SMART-R™ Materials: Component Analysis

While the overall wall system design is an important factor in a building's overall thermal performance, it is the building details that are most critical. In fact, windows may account for up to 40% of a building's enclosure per the prescriptive building envelope energy compliance path in the ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) Standard 90.1 (2010). This means there can be hundreds of feet of window perimeter details (conditions) not optimized for thermal performance —specifically panel-to-window transitions at the head, sill and jamb. When the walls and windows are not engineered to work together properly, the result is increased heat loss or risk of condensation, impacting thermal performance and creating an environment for mold or corrosion to occur.

**FIGURE 4**

Reduction in heat loss with Smart-R Wall solution compared to brick masonry veneer and architectural precast concrete.



A key to the industry-leading performance of the Smart-R Wall Solution is the integrated detailing at window openings. CENTRIA's Formavue 600 shop assembled window frame system offers integrated head, sill and jamb details that feature large thermal breaks aligned with the panel insulation, as well as additional insulation in the head of the window frame.

**TABLE 1**

Insulation used in the above wall assemblies.

Assembly	Insulation Type	R-Value
Smart-R Wall	3"-T Formawall Dimension Series (FWDS)	22
Brick & Precast	Fiberglass BAT (6")	6
	Board Stock (2")	13

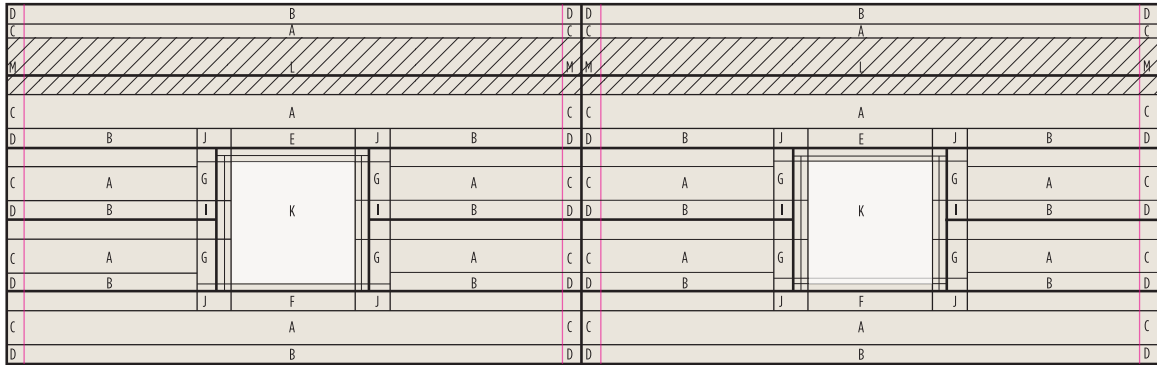
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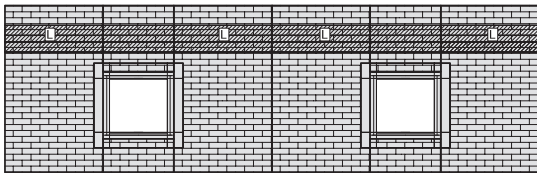
A parametric analysis was performed to determine a relative comparison in thermal efficiency of a 500 ft<sup>2</sup> wall consisting of CENTRIA's Smart-R Wall Solution components, brick masonry veneer and architectural precast concrete systems.

**FIGURE 1**

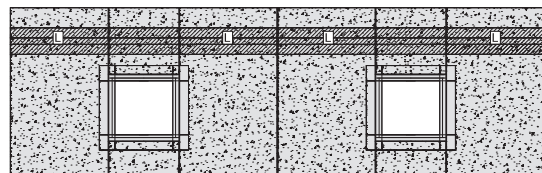
Schematic of 500 ft<sup>2</sup> wall.



**Smart-R Wall**



**Brick Masonry Wall**

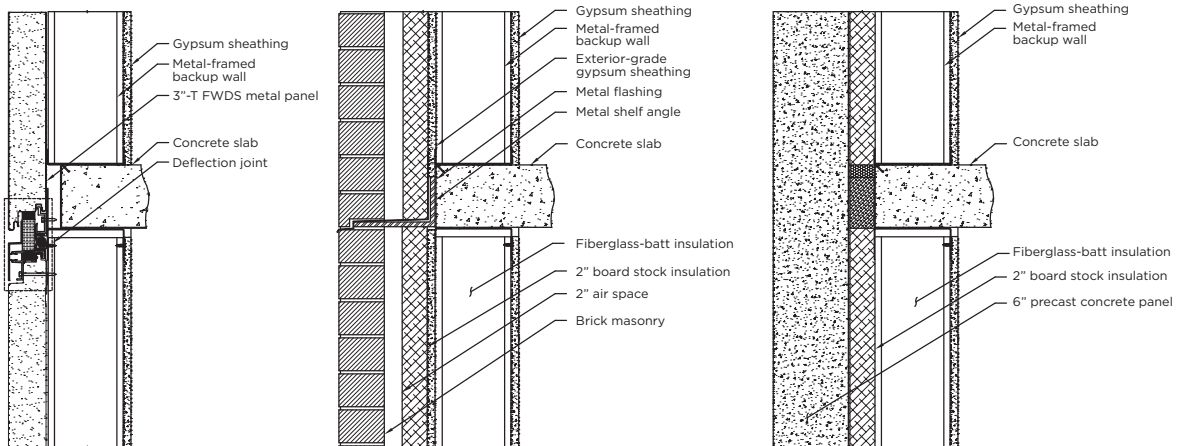


**Precast Concrete Panel Wall**

- A** Center Panel
- B** Horizontal Panel Joint
- C** Vertical Panel Joint
- D** Horizontal-to-Vertical Joint Transition
- E** Panel-to-Window Head Transition
- F** Panel-to-Window Sill Transition
- G** Panel-to-Window Jamb Transition
- H** Vertical Mullion (Not shown. Included only for 20%, 30%, and 40% window area)
- I** Horizontal Panel Joint-to-Window Jamb Transition
- J** Horizontal Panel Joint at Window Corner
- K** Glass
- L** Deflection Joint/Shelf Angle/Slab Edge
- M** Deflection-to-Vertical Joint Transition

**FIGURE 2**

Details for wall systems analyzed.



**Smart-R Wall**

**Brick Masonry Wall Assembly**

**Precast Concrete Panel Wall Assembly**

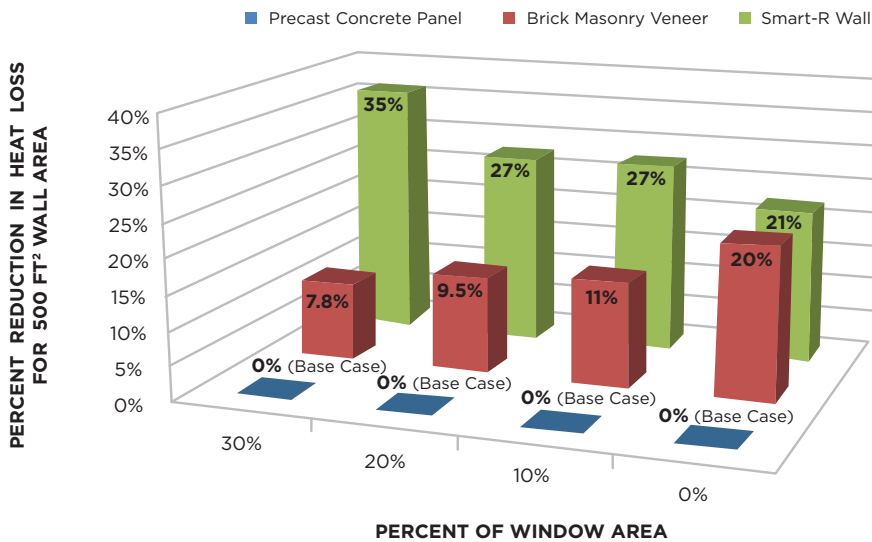
# SMART-R™ Materials: Wall Analysis

The results illustrate the importance of providing thermally efficient cladding and integrated window systems as well as the contribution that these conditions make on the overall thermal performance of the wall.

In a 500 ft<sup>2</sup> area with glass areas between 10% and 30% of the wall, the Smart-R Wall Solution provides as much as a 35% reduction in heat flow over standard industry brick masonry veneer and architectural precast concrete.

**FIGURE 3**

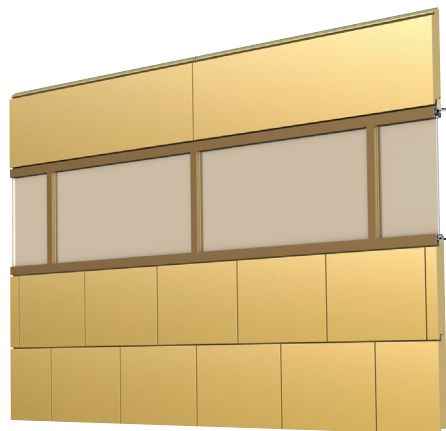
Reduction in heat loss for walls with Smart-R Wall Solution components [3"-T Formawall Dimension Series (FWDS), Insulated Metal Vertical (IMV) and Formavue 600 (FV 600) windows] compared to standard industry brick masonry veneer and architectural precast concrete panel systems.



Centria's outstanding design, development and technology makes the Smart-R Wall Solution the most energy efficient integrated Insulated Metal Panel (IMP) and aluminum window available.

## Smart-R Wall

- 3"-T Formawall Dimension Series (FWDS) or Formawall Graphix Series (FWGS)
- Insulated Metal Vertical Joint (IMV)
- Formavue 600 (FV 600) Window
- Advanced Thermal Moisture Protection (ATMP) Panel Extrusions
- ATMP Deflection Joint



**NOTE:** The analysis and annotated thermographs in this document were generated using THERM 6.3, two-dimensional heat transfer analysis software developed at Lawrence Berkeley National Laboratory (LBNL). The analysis measured heat loss through a 16" wide strip of the condition noted. These analyses do not account for heat transfer due to air leakage across the building enclosure or solar heat gain through the windows. The analysis was conducted with 70 deg F indoor and 0 deg F outdoor wintertime temperatures.