Integrated Framing

Business Summary:

- Integrated Framing makes construction more efficient by pre-engineering and pre-wiring power and data within the framing of glazed curtain walls.
- Preliminary data shows the system saves 8%-10% of initial construction costs, making photovoltaic (PV) thin film glazing economically feasible.
- The PV glazing pays for itself within 2-7 years, depending upon location.
- Integrated Framing turns traditionally energy-intensive commercial structures into building-shaped solar plants- a major step toward a built environment requiring Net Zero Outside Energy.
- Sensors embedded in the framing collect real-time weather data which can fine-tune lighting and HVAC systems- saving up to 40% of operating costs.

Customer Problem:

- Tenants of commercial buildings prefer offices with windows for the natural light and views provided, but suffer from the heat gain and glare commonly associated with current window technologies. Tenants also want power and data for equipment at their desks, and the flexibility to change furniture layouts or locations with minimal disruption.
- Building owners and facility managers are under tight lending and construction budgets. High-efficiency systems or alternative energy sources must pay for themselves within a few years at most.

Product/Services:

- Unlike other systems, Integrated Framing uses the empty channels INSIDE the building for wiring, where weather and temperature are controlled.
- Integrated Framing creates a positive cascade effect: generous windows provide light and a large surface area for turning solar radiation into electricity, NOT heat gain.
- Electricity is generated as direct low-voltage current, ideally suited to power solid-state (LED) lighting throughout the building.
- Because the roof is no longer needed for panels, a "green" planted roof can filter rainwater for use in plumbing fixtures, making the promise of Zero-Energy Input buildings a close-term reality.
- The key technology for Integrated Framing is a broadly-scoped patent covering wiring within any window framing system. The concept is protected by an issued patent in China, effective December, 2008 and Allowed (approved) in the US and Canada. Patents are pending in the European Union.

Information Systems-Building Systems and Smart Grid

Inventor/Manager:
Anne Elliott Merica, RA

Capital Received:
$80,000 Self-funded
$60,000 Autodesk Clean Tech Grant Software grant In-kind
100% Owner Equity

Capital Seeking:
$500,000 plus In-Kind for Production-Ready System

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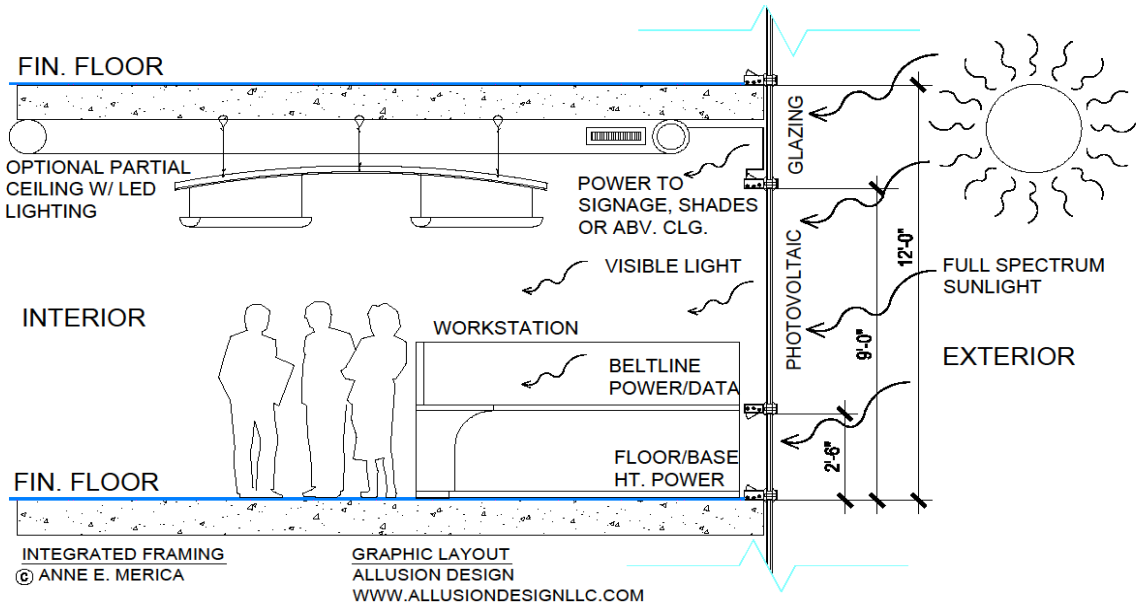
Project Description

Integrated Framing uses the empty channels inside window framing systems to collect and distribute power and data where users want it most- at the windows. Traditionally, stud partitions are placed above (bulkhead) and below (kneewall) the windows. The supporting wall must be created with metal framing, insulated and finished prior to window installation. The electrician is required twice- first to rough-in the service before the drywall is installed, and after the wall is complete to install outlet plates. Inspections require lags between close-in. All of these issues translate directly to costs.

Integrated Framing allows for a faster, more cost-effective, and better quality building. By eliminating the two-step rough-in and finish installation, and the duplication of wiring to the building core and back, the system can reduce material and labor costs for electrical and data installation by well over 50%. Integrated Framing eliminates the need for a separate partition, thereby allowing full height glazing. Upper channels can collect solar power, or provide power for lighting, shades or signage. Power and data at intermediate heights is ideal for "beltline" desk use. At the floor, discrete outlets provide power for personal electronics or retail displays. Outlets may be placed at any point along the length, and power collection, distribution, and data can be segregated into different pathways. Flexibility to add and re-route wiring as needs change is available by simply removing the cover plate.

The most promising aspect of the system is the "Smart Grid" it creates on the building exterior. The accessible grid allows for real time monitoring and control of building systems including: HVAC, lighting; power; multi-media and telecommunications- a critical feature of High Performance buildings. The many channels provide redundancy for grid security, surveillance and access control. The system can self-report for maintenance, monitoring off-site, and populating a national energy database.



A Cost Effective Solution:

- Architect-designed system avoids custom costs and schedule.
- Pre-engineered component system for ease of selection and installation.
- Eliminates two-step work by electricians- rough-in and finish.
- Eliminates out-of-sequence trades (studs, insulation, gypsum board).
- Quick connectors eliminate the need for pre-close-in inspections.
- Reduces or eliminates core electrical rooms.
- Utilizes existing slab edge conditions (no core drills).

A Green Technology:

- Eligible for LEED credits: renewable energy capture; recycled/recydable materials; daylighting; shading; user controls; lean manufacturing; and innovation.
- Allows full height vision glazing for maximum daylighting.
- Provides low voltage, direct power ideal for solid state (LED) lighting.
- Utilizes vertical surfaces for solar collection, allowing “green” roofs.
- Allows single-scope enclosure, power and data- ideal for gut structural rehabs.
- Provides wiring grid on building enclosure for real time monitoring and control of building systems including: HVAC; lighting; multi-media and telecommunications.
- Provides redundancy for grid security, surveillance and access control.
- Can self-report for maintenance, monitoring off-site, and populating national energy database.

A Clean, Elegant Look:

- Utilizes standard window extrusions, forming and finish systems.
- Works with window, storefront, curtain-wall and entrance framing.
- Finishes match framing: clad, clear or dark anodized aluminum, polymer colors.
- 5’ -6’ vertical mullion spacing is ideal power spacing.
- Typical sill height of 24-36” above floor is ideal for desk (beltline) power.
- Provides power at retail windows for lighting, signage and displays.
- Continuous vertical channels allow for direct “homerun” or zoned cabling.
- Power and Data can be isolated in horizontal, vertical channels or with inserts.
- Scales well- capacity increases with building height and frame depth.
- No unsightly patches- allows flexible access to data, control, video, and intercom systems.


The photos above show one possible installation with a pop-up outlet as patented and manufactured by Doug Mockett & Company, Medium Aluminum Flip-Up Grommet PCS36B.

Target Market:

- The target market is massive: window systems for commercial construction are projected to generate $89.3 Billion in the US, Canada, EU and China by 2015. Even with the economic downturn, the global market has remained strong, with growth shifting to underdeveloped areas with lower labor rates.
- Solar technologies are growing at a rate of over 20% per year. Thin film efficiency, a key factor for product performance, is currently at 8-10% but has been improving by several percentage points per year, with novel organic thin films in development.
- The system opens a huge new market for thin film technology- one not subject to the commodity pricing of crystalline silicon roof panels.

Sales/Marketing Strategy:

- Insight from 25 years in the business will allow the team to address each stakeholder in the commercial real estate market: owners, architects and engineers, tenants and facilities managers.
- Documentation in Building Information Modeling (BIM) format will encourage early specification and prevent substitutions.

Business Model:

- To take advantage of mature delivery chains, the patent will be licensed to the curtain wall manufacturer for assembly, distribution and installation. Other leading suppliers have been selected for their strength in each area of expertise or a particular market. The percentage of returns for each participant is based on the respective investment of capital, IP, in-kind labor and materials during the R&D and manufacturing phases.

Competition:

- The main competition to IF is the status quo of the very traditional building construction industry, based on old guilds, narrow scopes of work and custom engineering for each project.
- Many solar experts and manufacturers have dismissed thin film due to low efficiency compared to crystalline silicon modules. Development of transparency characteristics has been secondary.

Competitive Advantages:

- The sheer surface area that IF provides over the entire building makes the efficiency of the thin film much less of an issue.
- Costs are competitive to other construction methods. Incorporating the PV within the building enclosure system allows costs to be absorbed in the total and calculated by overall building area.
- Pre-engineering and virtual prototyping with the use of Building Information Modeling (BIM) allows conflicts to be modeled and solved before they can cause cost and schedule overruns. The system addresses current technical and cost barriers by resolving technical concerns, providing up-front coordination, clarifying scope issues, demonstrating effectiveness and reducing risk.
- To ensure that products do not get substituted during the bid phase, value is shared with the contractors and installers.
- Competing thin film technologies offer additional markets for the patented wiring solution that IF provides.

The Team:

A team has been selected for the R&D phases of the project, including:

- **Anne Elliott Merica, RA** The Inventor and Manager is a licensed architect with over 25 years of experience in commercial design and construction, including all aspects of high-performance building systems. She recently spent the summer in China, validating the cost estimates and business plan with the help of engineering and business students from the I5 Program, an interdisciplinary team of Baylor and American Universities, and the Chinese National Science and Technology University.
- **Suntech America** is the US subsidiary of the world's largest solar product manufacturer, and brings the latest technology in solar energy collection to the project. They have the unparalleled ability to take improvements to the market, with several manufacturing plants in operation, and a recently announced plan to build a 40MW manufacturing facility in the Phoenix, AZ area.
- **DPR Construction** Ranked in the top 50 general contractors in the country over the last 10 years, DPR is a national firm based in Falls Church, Virginia. The firm specializes in mission critical technology, research and health care facilities and brings a commitment to process innovation with the stated goal of becoming one of the most admired companies by the year 2030.
- **Advantage Glass Company, inc.** is a local framing and glazing contractor bringing engineering assistance and fabrication abilities to the team for rapid prototyping, along with reality checks on feasibility and installation factors.
- **Wieland Electric** The global wiring manufacturer provides valuable expertise in building systems interfaces with a specialty product line for quick connections and BIPV installation. The company is participating with systems advice and support through the local distributor and supplier.
- **Balance of System (BoS) equipment**, including the inverters, batteries and connections to the grid are expected to be provided by local installers familiar with the utilities, rebates and other credits in that locality.

The Next Steps:

- An Autodesk Clean Tech grant was received- providing up to $150,000 in software to design, manufacture, construct and monitor the system using state-of-the-art Building Information Modeling (BIM) format as an example of best practices in the industry.
- Applications for grants are pending for a 6-month rapid virtual prototyping period and for validating initial cost estimates showing construction savings and payback periods. Phase II will entail a full-scale installation, ideally at a US National Laboratory which has just received funding for Net Zero Energy Building research. The following 12-month testing protocol will result in a system pre-approved for installation by all safety and building code agencies.

More Information, including a Development Roadmap and FAQ Sheet is available on our website IntegratedFraming.com, via email at: IntegratedFraming@live.com, and by phone at 703.585.8059