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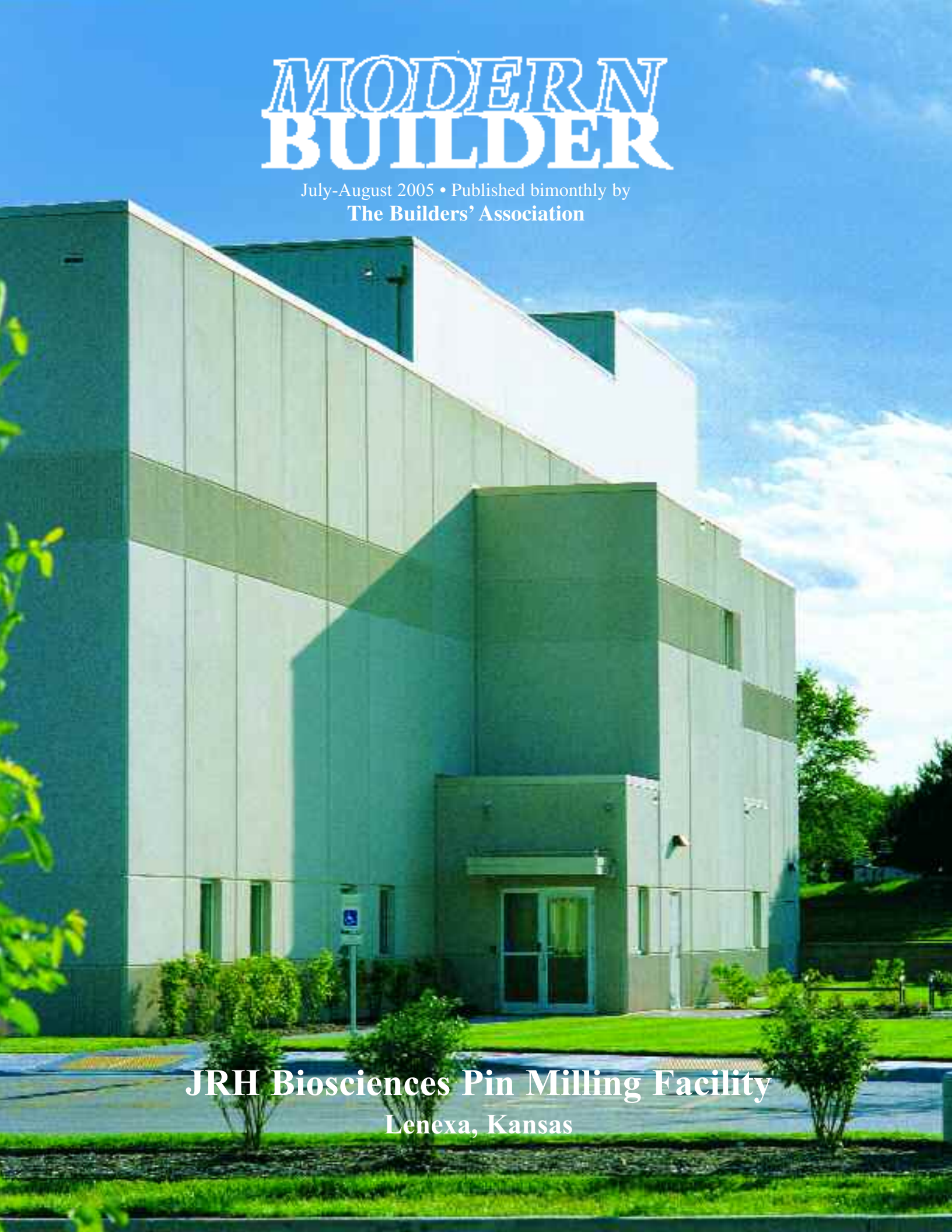

JRH Biosciences Pin Milling Facility

Lenexa, Kansas

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632 West 39th Street
Kansas City, Missouri 64111-2910
phone: (816) 531-4741
www.buildersassociation.com

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McCown Gordon Builds a State-of-the-Art Processing Facility for JRH Biosciences

McCown Gordon Construction, L.L.C. has completed work on a 51,000 square foot, $12.5 million expansion for JRH Biosciences, a developer and manufacturer of dry powder media for cell culture use. The new facility features pharmaceutical grade construction and clean-in-place technology. It is located at 13804 W. 107th Street in Lenexa, Kansas.

Ground was broken on the facility on February 13, 2004. The date of substantial completion was January 3, 2005 – two months ahead of schedule and under budget, said Ramin Cherafat, Vice President of McCown Gordon, the general contractor and construction manager. Dedication ceremonies took place on Thursday, July 21.

The new facility is a two-story, conventional steel beam structure with composite concrete floors and a precast concrete skin. It was built on a three-acre green field site just north of JRH Biosciences' existing facility, which has served as its global headquarters since 1981.

The existing facility will continue to house technical staff and be used for serum filtration, said Susan Bridges, Marketing Communications Manager, SAFC JRH Biosciences. (On display in front of the existing facility, as a symbol of JRH Bioscience's history of sterile filtration of animal – primarily bovine – serum products, is Bossy Nova, which was part of CowParade Kansas City in 2001.)

Photographed at the east side of the new JRH Biosciences Pin Milling Facility are McCown Gordon Project team members (left to right): ***Ramin Cherafat****, Vice President;* ***Mike Carter****, Senior Project Superintendent; and* ***Chris Martin****, Senior Project Engineer.*

Cover photo: View of the north side of the JRH Biosciences Pin Milling Facility. The exterior features 43-foot high precast concrete panels defined by vertical reveals with vertically ribbed concrete fluting at the ground and upper levels. Metal paneling encloses the penthouse areas containing equipment handling and the pre- and post-blenders.

The east door opens to a corridor leading to the lunchroom (the north windows of which are visible in the left foreground), dry storage/warehousing, and the gown changing rooms. The stairwell on the north accesses the finished goods area on the first floor and the formulation rooms (where the chemicals are weighed) on the second floor. (Cover photo by Paul Kivett)

SAFC is the fine chemicals business of Sigma-Aldrich, an international life science and high technology company with corporate headquarters in St. Louis, Missouri. JRH Biosciences was acquired by Sigma-Aldrich in February of this year.

The lead design engineers on the new facility, Jon Ficken, PE (electrical), Keith Kettler, PE (HVAC), and Jason Haldiman, PE (process utilities), are with CRB Consulting Engineers. Andrew Stepp, the project architect, and Dave Niemann, the structural engineer, are with The Clark Enersen Partners.

Pin milling is one of the processes by which JRH Biosciences refines cell culture products. During this process, lot-specific raw materials are fed through a pre-blend hopper into a pin mill. The pin mill's rotating disks propel the raw materials centrifugally outward onto stationary intermeshed pins. The pins reduce the raw material particles to a homogenous size, improving their solubility.

A Watershed Moment

Configuration of the powdered media production line was a major area of discussion during the preconstruction phase, said Ramin Cherafat. The simplest

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solution – to allow the media to be gravity-fed through the upper blender, pin mill, lower blender (which reblends the powdered media), and filler (where the media is packaged for the consumer) – would have required a tower over 80 feet tall, said Andrew Stepp.

This solution would have required a variance to City of Lenexa zoning ordinances, which limited the building to a height of 45 feet.

The project team decided to set the blenders in adjacent rooms on the second floor – and use a nitrogen enriched recirculation line to transfer the powdered media back up through the second blending cycle.

"It was a watershed moment early in the design phase when we realized that placing the blenders alongside each other was the only feasible way to design the production line," said Andrew. McCown Gordon, which built the infrastructure for the nitrogen tank on the southeast exterior of the new facility and installed the piping to the tank, was involved early on in the design process.

Dry powder media is now weighed and added to the pre-blender on the second floor, gravity fed to the pin mill on the first floor, transferred via a five-inch duct back up to the second floor post-blender, and gravity fed back to the filler on the first floor. The finished product is produced in batches weighing up to four tons each.

– photography © Paul Kivett

View looking southwest toward the new JRH Biosciences Pin Milling Facility. The grassy area north of the facility is a detention basin for stormwater runoff. Beyond the nitrogen tank (on the southeast corner of the building) is the new loading dock. The existing facility lies south of the loading dock.

"The most critical decision JRH made was to engage McCown Gordon at the start of the design process. By providing JRH direct pricing throughout the design, McCown Gordon enabled JRH to maximize its project value at each step of the design process. This saved JRH between $500,000 and $1,000,000 on a $12.5 million project budget, and enabled us to spend money in a much more intelligent manner."

– **Kurt Buchholz,** Project Manager, JRH Biosciences

Installing the Blenders

About a third of the way into construction, said Ramin, the project team learned that the blenders (which were designed and manufactured by a firm in Holland) would arrive two months later than scheduled.

"We looked at several different options for ensuring that construction would proceed uninterrupted while we waited for the blenders, and then installing them once they arrived," said Ramin.

"These options included removing panels from the north side of the new facility, delaying installation of the entire roof, and temporarily leaving out a side of the building," Ramin continued.

"We went back to Dave Niemann who, as structural engineer, redesigned the roof so that the portion over the process areas could be removed, the blenders hoisted in, and the area reroofed.

"This solution enabled us to finish ahead of schedule," Ramin added.

The roof over the process area clean rooms was enclosed with modified bitumen, a resilient roofing material. The main roof system consists of a fully-adhered .060 EPDM rubber roof membrane over three inches of polyisocyanurate roof insulation – all supported by open web steel joists.

At 4 a.m. on November 4, 2004, McCown Gordon began removing the subject roof area. Each blender was hoisted over the building and set down into its respective processing room. At about 10 p.m., with the site illuminated by lighting towers, construction workers finished reinstalling the roof.

Class 100,000-Designed Clean Rooms

Each of the four processing rooms in the pin milling area (pre-blend and post-blend on the second floor, and pin milling and blend/fill on the first floor) was specially designed and constructed as a classified clean room space. Clean room technology facilitates control of airborne particle concentrations – in this case, an allowable maximum of 100,000 particles that are 0.5 microns and larger per cubic foot of air.

The air-handling units feeding the clean rooms have HEPA filtration (High Efficiency Particulate Arrestors) that remove contaminants from the air. The clean rooms are constructed to minimize air leakage, with all structural joints and edges sealed. The clean rooms also have double wall cavities for services and air plenums, air lock entry systems, and special lighting. The battenless walls and ceilings provide a barrier to humidity loss or gain.

The structure encapsulating each process room is completely waterproof. The floors, walls, and ceilings in the process rooms were coated with high-end epoxy, and the equipment and piping made of stainless steel, so they can be regularly hosed down with water.

The four main process rooms and the adjacent support spaces were required to maintain 68°F and 20 percent relative humidity due to the nature of the dry powder media. This was accomplished with separate air handling units for each of the stacked suites and a desiccant air handling unit located on the roof.

The temperature and humidity requirements do not pertain to ancillary spaces such as the warehouse and mechanical room, where temperatures are more elevated.

Room to Grow

The finished space including the

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loading dock comprises about 46,000 square feet. About 5,000 square feet on the northwest remains open and unfinished, and is available for two future process room production lines.

The steel beams and gravel flooring are currently in place in the expansion area. When this space is built out, it will comprise 10,000 square feet (over two floors), bringing the gross square footage to 56,000 square feet, said Andrew Stepp.

Phasing of the New Dock

To ensure that existing serum deliveries would continue uninterrupted, McCown Gordon phased in a new and expanded shipping and receiving dock. The new dock connects the existing facility on the south with the new Pin Milling Facility on the north.

The original dock doors were on the north side of the existing building. During the first phase, McCown Gordon constructed half of the new dock just west of these doors, leaving them operational.

During the second phase, the dock was temporarily relocated to the north side of the new half so that construction could begin on the eastern half of the new dock.

The new dock has five doors (three more than the original), all of which face east.

Of the two original dock doors, one was enclosed with masonry. The second was partially expanded and converted to a doorway leading to the new dock.

– photo by Andrew Stepp

The conical pre-blender vessel is prepared for installation on November 4, 2004. Following installation of the pre-blender, the post-blender was installed. (The building in the background is JRH Bioscience's neighbor to the west.)

– photo by Terry Weckbaugh, Image Quest

The first floor pin mill room at the center of the building (east of and adjacent to the blend/fill room) is the heart of the new pin milling facility.

The pin mill rests on a stainless steel frame. The pre-blender penetrates the second floor.

The pin mill room is a Class 100,000 designed clean room with tightly-controlled temperature and humidity requirements. Everybody who enters this room must be completely gowned.

This room, like the other three process rooms, employs the "clean-in-place" method of cleaning pipes and process equipment. Clean-in-place does not require manual dismantling of equipment components, and is designed to achieve a federally-mandated degree of cleanliness.

Parking

Two new parking areas were added adjacent to the new facility, one with 44 spaces on the east side and another with 94 spaces on the north side. West of the existing facility are 36 existing spaces, 15 of which are reserved for visitors.

The grassy area north of the new building serves as an above-grade detention basin for stormwater runoff. The project team built a retaining wall on the north and west sides of the basin.

An employee break area with a small kitchenette is located in the northeast corner of the first floor. The lunch room has seating for about 25 people.

A.D. Jacobson Company, Inc., the mechanical contractor which installed the stainless steel piping in the process areas as well as the HVAC, received an Outstanding Mechanical Installation Award for their work on the project from the Mechanical Contractors Association of Greater Kansas City. Rick Roth was Project Manager, and Laurie Shadrick was Pipe Fitters Foreman, for A.D. Jacobson. ▲

View looking northwest from the future warehouse addition on May 19, 2004. The shaft of the elevator used for the transport of chemical compounds is visible at right. The high bay space over the process rooms is visible beyond the elevator shaft and extends out to the right (north).

The entire east side (except for the lunch room) is used for warehouse raw materials storage. It is open on the second floor, with 30-foot-high bays for high-rise pallet racks. (Photo by Matt Clay)

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