NPS Form 10-900
(Rev. 10-90)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable". For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer to complete all items.

1. Name of Property

Historic name Walter and Ruby Behlen House

Other names/site number PT01-538

2. Location

Street & number 2555 Pershing Road Not for publication [ ]

City or town Columbus Vicinity [ ]

State Nebraska Code NE County Platte Code 141 Zip code 68601

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this [x] nomination [] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [x] meets [] does not meet the National Register Criteria. I recommend that this property be considered significant [] nationally [x] statewide [] locally. ([] See continuation sheet for additional comments.)

Signature of certifying official Date 1/21/03

Director, Nebraska State Historical Society
State or Federal agency and bureau

In my opinion, the property [] meets [] does not meet the National Register criteria. ([] See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby, certify that this property is:

[x] entered in the National Register. 3-11-03
[ ] see continuation sheet.
[ ] determined eligible for the National Register.
[ ] see continuation sheet.
[ ] determined not eligible for the National Register.
[ ] removed from the National Register.
[ ] other, (explain): _____

Signature of Keeper Date of Action

5. Classification

Ownership of Property
(Check as many boxes as apply)

- [X] Private
- [ ] Public-local
- [ ] Public-state
- [ ] Public-federal

Category of Property
(Check only one box)

- [X] Building(s)
- [ ] District
- [ ] Site
- [ ] Structure
- [ ] Object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
1		Buildings
		Sites
		Structures
		Objects
1		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

N/A

6. Function or Use

Historic Functions
(Enter categories from instructions.)

DOMESTIC/single dwelling

Current Functions
(Enter categories from instructions.)

DOMESTIC/single dwelling

7. Description

Architectural Classification
(Enter categories from instructions.)

MODERN MOVEMENT

Materials
(Enter categories from instructions.)

Foundation Concrete
Walls Steel
Roof Steel
Other

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark "X" in one or more boxes for the criteria qualifying the property for National Register listing.)

___ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

_X_ **B** Property is associated with the lives of persons significant in our past.

_X_ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

___ **D** Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations
(Mark "X" in all the boxes that apply.)

Property is:

___ **A** Owned by a religious institution or used for religious purposes.

___ **B** Removed from its original location.

___ **C** A birthplace or a grave.

___ **D** A cemetery.

___ **E** A reconstructed building, object, or structure.

___ **F** A commemorative property.

_X_ **G** Less than 50 years of age or achieved significance within the past 50 years.

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

Areas of Significance
(Enter categories from instructions.)

ARCHITECTURE
INDUSTRY
ENGINEERING

Period of Significance

1958

Significant Dates

1958

Significant Person
(Complete if Criterion B is marked above.)

Behlen, Walter Dietrich

Cultural Affiliation

Architect/Builder

Leo Daly Architectural Firm – Architect of Record
Jack Savage – Principal Architect

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

___ Preliminary determination of individual listing (36 CFR 67) has been requested
___ Previously listed in the National Register
___ Previously determined eligible by the National Register
___ Designated a National Historic Landmark
___ Recorded by Historic American Buildings Survey #_____
___ Recorded by Historic American Engineering Record #_____.

Primary location for additional data:

_X_ State Historic Preservation Office
___ Other State agency
___ Federal agency
___ Local Government
___ University
_X_ Other
Name of repository: Nebraska State Historical Society Library/Archives

10. Geographical Data

Acreage of property Less than one

UTM References (place additional UTM references on a continuation sheet).

	Zone	Easting	Northing		Zone	Easting	Northing
1.	14	637689	4588785	3.			
2.				4.			

[ ] See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Jill M. Ebers – Historic Buildings Survey Coordinator
organization Nebraska State Historical Society date October 29, 2002
street & number 1420 P Street telephone (402) 471-4773
city or town Lincoln state Nebraska zip code 68501

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs
Representative **black and white photographs** of the property.

Additional items
(Check with the SHPO or FPO for any additional items.)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name/title Ruby Behlen
street & number 2555 Pershing Road telephone (402) 564-8179
city or town Columbus state Nebraska zip code 68601

The Walter and Ruby Behlen house was built on the fringes of Columbus in 1958. There was very little being built in the area at the time, aside from a new high school building concurrently constructed a block to the west. The building was constructed in a very industrial fashion on a large scale, causing local residents to assume it was going to house a business or perhaps a library for the high school. Curious passersby would approach the house at night whenever the lights were shining through the windows in order to get a view of the interior. Over the years, a subdivision of 1960s houses grew up around the Behlen house. The periphery has become part of the core of Columbus.

The 8,500 square-foot 1958 residence is an irregularly shaped (though vaguely rectangular) one story steel building with a corrugated metal roof. It has a concrete slab foundation and is made of corrugated steel load-bearing walls fabricated at the Behlen Manufacturing Company. The floor of the house is almost perfectly flat, with only a quarter inch variation from one end to the other. The house was built to be a showcase for the potential uses of industrial materials for domestic purposes.

A patio is located on the eastern side of the house. The patio is fashioned of a poured concrete slab, and has four concrete planters with concrete seats suspended between them for bench seating. A stone fence wraps part way around the house on the east, utilizing extra Mount Shukson stone that was left over from the construction of the a fireplace found on the interior. Mature specimen trees, including a blue spruce and ponderosa pine, dominate the landscape on the western side of the house. A weeping birch is a focal point of the main approach to the house on Pershing Drive at the southwest corner of the property. Groupings of crabapple trees at the north property line lend sculptural qualities to the landscape and contrast to the architectural qualities of the house.

The windows of the Behlen House are primarily fixed floor-to-ceiling curtain windows. In the living room on the west side of the house, a series of thirteen floor-to-ceiling windows are protected by mechanical louvers. The louvers are tall enough to cover the windows completely, and a mechanical motor moves them from a position perpendicular to the glass, to a position that completely closes the windows off from the outside. At one time, Mr. Behlen considered hooking the motor up to a photocell, which would allow the louvers to move with the sun, like a sunflower bloom following the sun across the sky. The photocell was never installed. The north elevation features large picture windows into three of the bedrooms. On the east side of the house, the patio features eight floor-to-ceiling windows that allow sunlight to enter the family room. Immediately adjacent to the north are eight additional windows that open into the natatorium. The ceiling of the pool room is several feet higher than the other rooms of the house, partially to allow clearance for the use of the diving board, but also to allow space for clerestory windows around the perimeter of the room, providing as much sunlight as possible. The majority of the windows in the Behlen house are fixed in place. Fresh air was obtained through the opening of the damper, located in the furnace room.

The west façade contains an off-center recessed formal entrance with four floor-to-ceiling glass panels beside the door. One glass panel is found to the right of the door, and three to the left, when viewed from the exterior. The recessed vestibule of the formal entry into the home has a tile floor and steps, and a built-in stone planter on the left made of stone from Mount Shukson in Washington. A steel guide rail is located in the center of the steps. The recessed area is covered with a "roof" of redwood two-by-fours placed on their narrow sides with spaces between for sunlight to pass through.

The family mainly entered the house through the side door on the south side of the house, located east of the garage, which enters into the kitchen and laundry area. The Behlen family considers the kitchen to be the heart of the house. The kitchen has a rather modest sized working area, with an island set between the kitchen and the breakfast table. A skylight was built over the breakfast area. Along the west wall of the kitchen adjacent to the breakfast table, an enormous set of cabinets and a desk of fruitwood were built in. The cabinets and drawers are very specialized, with certain shallow

drawers intended for table linens, and others intended for specific purposes. All of the fruitwood cabinets were constructed with Soss hinges, which are completely hidden from view when the door is closed. The hardware is concealed in the routered door and frame, keeping unsightly hardware from view. All of the wood cabinets and doors utilize soss hinges; there is not a hinge visible in the entire house. The laundry room is approximately the same size as the kitchen. Both rooms have St. Charles cabinetry: peach in the laundry room and seafoam green in the kitchen. The Behlen house was built for entertaining. By simply closing the pocket doors to the kitchen and laundry area, the kitchen becomes isolated from the rest of the house, making the preparation of refreshments a private affair. The pocket doors are constructed of wood and fiberglass panels, which fold into the wall accordion-style when not in use.

The furnace room is situated behind the laundry room. Walter Behlen built the house with the intention of showing how industrial materials could be used for domestic construction purposes. His house was over built, as if preparing it for industrial uses. For instance, the house utilizes over sixteen miles of single conductor wire, and three phase 220 circuits, the same as was used on the battleship *Missouri*. The house originally had a gas-fired industrial boiler with expansion tanks. This has been replaced with four heat pumps. The house has an evaporation tower, air inlet, and exhaust. Fluorescent lights are utilized in the living spaces, but to prevent the fluorescent lights from buzzing in an irritating manner, all the ballasts were placed in the furnace room. The house is also hooked up to a two-inch water main. By comparison, most houses have a ¾ inch water main. The house was over built in order to take advantage of industrial technologies and ensure the house's smooth operation.

The kitchen opens into a hall that leads to the front door. The family room is located north of the kitchen on the opposite side of this hallway. The fireplace, and a large portion of the wall around it, is constructed of green stone from Mount Shukson. The blond brick hearth is raised off the floor, creating a bit of seating or shelf space along the wall. Cork tiles cover the floor in the family room. The north wall of the family room is made entirely of glass curtain-wall panels that are set in sliding frames. Through these windows, the pool room is visible and accessible. One or more panels could be opened to allow entry into to the natatorium, or poolroom. Natural sunlight from the clerestory windows in the poolroom also provides light to the family room. A former closet in the family room was modified into a wet bar, and is found on the opposite wall.

The pool itself is also made of Behlen corrugated metal panels. The panels were treated in order to waterproof and rustproof the steel, but the distinctive curves of the panels are obvious. The pool itself is rather narrow, but the design allowed plenty of tiled deck space around the pool for lounging and entertaining. The Behlen corrugated panels of the ceiling of the poolroom are visible, although they are covered in a sprayed insulation. A barbeque, constructed of additional Mount Shukson stone, is located on the wall shared with the family room. The barbeque shares a chimney with the family room fireplace. The smoke is diverted to the chimney through a copper hood mounted above. Four doors are located along the north wall of the pool room. Three of these doors lead to bathrooms, and an additional door leads to a utility room that administers the functioning of the pool maintenance system.

Grace Harlan Kennedy of Orchard and Wilhelm of Omaha decorated the house. Kennedy recommended the use of Scandinavian furnishings, which were extremely popular at the time. The original decorations for the house are still present, including chairs by Eero Saarinen and Charles Eames. A Herman Miller desk is found in Walter Behlen's office.

Proceeding down the hallway from the family room and kitchen, the dining room is found on the right. The dining room has a window overlooking the pool area. A door on the left leads to the garage. The exterior garage door is constructed of clear heart redwood and spans the entire width of the three-car garage. It was so heavy that Walt had to devise a special garage door opener that was strong enough to heft the substantial door. The foyer and the front door are located just beyond the doorways to the garage and the dining room. The hallway that leads from the kitchen to the front door is

paneled in Burmese teak. A teak pocket door is also found between the kitchen and the hallway to the dining room. Whole trees were imported from Burma for constructing paneling and doors. Walt and Ruby's children remember receiving weekly updates about the teak trees that would describe which bend of the river the trees were nearing that week. In the foyer itself, teak box beams separate square panels of mirrors on the ceiling. The wall to the left of the door is also mirrored. The floor-to-ceiling window panels to either side of the door have Chinese screens that were hand-carved in Hong Kong to fit the spaces of the windows. Marble tile covers the floor of the foyer. The front door has a knob made from a solid nickel meteorite, evidence of Walt's interest in space exploration and science.

Turning the corner, the hallway continues north toward the formal living room. This hallway was decorated with silver metallic paper that was then painted with rose vines and birds on the west wall. The opposite wall was papered in the same metallic paper with grass cloth applied to the paper. The V'Soske carpet was completely hand loomed, and made to perfectly fit the space for which it was intended. The living room is located on the left side of the hallway. The louvers covering the windows are visible from inside this room. The draperies that shield the room from the sun from the inside were hand-woven by Maria Kipp. The north wall of the living room is occupied by a second fireplace, which is made of travertine marble. Teak bookshelves flank the fireplace on each side. The west bookshelf was formerly a passage between the living room and Walt's office, but Mr. Behlen constructed a built-in bookshelf for each room to use the space more efficiently. Walt's office is characterized primarily by built-in bookshelves filled with books and artwork. The entire north wall of the room is occupied in this manner. On the south wall, a teak cupboard contains an early Stereophonic High Fidelity record player and an intercom system. The mechanical louvers also shelter the windows in his office.

Turning the last corner at the end of the hallway, one enters the private portion of the house where the bedrooms are located. A guest bedroom is found at the northwest corner of the house. Moving east down the hallway, one finds the two bedrooms that belonged to Walt and Ruby's children, and the master bedroom and bath. The guest bedroom has its own attached bath. In each bedroom, the bottom of every closet contains a cold air return and the closets have automatic lights that turn on whenever the door is opened. The master bedroom has a panel of switches that controls all of the lights in the house, an innovation Walt requested. On the right side of this hallway, doorways are found that allow access to the three bathrooms that are also accessible from the poolroom. The inclusion of three separate baths directly adjacent to the pool room illustrates the extent to which this house was designed with entertaining in mind. Every bathroom in the house has a skylight to provide natural light.

The house exhibits exceptional historic integrity. Nothing of substance has been altered in the house since it was constructed in 1958. The Walter and Ruby Behlen House is a fascinating example of an architect-designed house built using industrial corrugated steel and aluminum panels, panels which until then had been used for primarily industrial, commercial and agricultural uses.

The Walter and Ruby Behlen House is located in Columbus, Nebraska, which lies north of the Platte River in Platte County with a population of 20,971 (2000 Census). Columbus is located eighty-eight miles west of Omaha, and is intersected by US 30 and US 81, the former Lincoln and Meridian Highways. The intersection of these two transcontinental highways created an excellent shipping origin for manufacture and industry. Indeed, Columbus is currently the most industrialized city per capita in Nebraska, with 7000 manufacturing jobs at more than eighty different manufacturers. Of these industrial enterprises, Behlen Manufacturing Company is the second largest in Columbus, with almost 1000 industrial jobs available in the fabrication of steel buildings and agricultural products. Walter D. Behlen began this company in 1936 in Columbus, and his ingenuity spurred the company's meteoric growth over the ensuing years. His steel buildings have become ubiquitous across Nebraska's landscape, and their familiar corrugated curves are found in many other parts of the United States as well. Between his company's mesh corncribs and steel buildings built for agricultural and industrial purposes, Behlen products have made a significant impact on Nebraska's farms and rural landscapes.

Criterion B:

Walter Behlen was a scientist, an innovator, and a consummate businessman. Though he had only a high school diploma, his naturally curious and inquisitive nature led him to investigate possibilities that most would consider out of their grasp. Together with his brothers and father, he started the Behlen Manufacturing Company in 1936, a company whose chief asset was an old drill press. Experience on the family farm had taught him to solve problems and create needed equipment with the supplies he had on hand, and he carried this philosophy on in his company. When the company needed dies to fabricate the fluted corrugations of his major innovation, structurally sound corrugated metal panels for frameless buildings, Walt made them himself. The history of the Behlen Manufacturing Company is peppered with incidents of his handiwork, on projects large and small. Behlen's frameless steel and aluminum buildings would come to have an enormous influence on the way our farmsteads and industrial areas look, and Walt had the largest role in making that so. Aside from designing the original metal panels for the buildings, he was a tireless promoter of his products, culminating in their being tested in Survival City, a mock-community subjected to an atomic blast at Yucca Flat, Nevada, which yielded priceless publicity for his product when they survived largely intact. Walt Behlen was a quintessentially American renaissance man, in combining an Edisonesque talent for invention and innovation along with a brilliant business and marketing mind. Indeed, Walt was granted the Horatio Alger Award on May 18, 1968, an award given to those whose careers reflect the spirit of achievement due to making the most of opportunities available despite any obstacles that had to be overcome.

Walter D. Behlen was born October 16, 1905, in Shell Creek, north of Columbus, the second of nine children.[1] He was raised on a farm in Platte County, and worked ceaselessly on the farm with his family until 1924, when his father sold the farm. Agricultural areas throughout the United States had been in an economic depression for most of the decade of the 1920s. Farm prices that spiked during and after World War I fell as drastically as they had risen. As prices fell in mid-1920, farmers were faced with debts they were unable to pay. Farmers' incomes did not keep pace with inflation, and a devaluation in land prices contributed to their financial problems. In addition, agriculture was becoming highly mechanized, and farm families that could not afford to buy the necessary equipment could not succeed financially. The Behlen family sold their farm and moved to Columbus. Walter Behlen entered high school in Columbus at the age of nineteen. A bout of the flu at the age of thirteen, coupled with serious complications, kept him from attending school previously. While attending high school, he worked for the American Railway Express Company every day as a platform man, and he continued to work for the company after he graduated.

[1] "Columbus business founder Behlen dies," *Lincoln Star*, 28 July 1994.

In October of 1936, Walter Behlen established a manufacturing business with his father, Fred, and brothers Adolph, Mike and Gilbert. They purchased the machinery, stock and patents of the Koziol Husking Hook Company, a business that had diminished long before being purchased by the Behlens.[2] Mechanization of farm tasks had made hand-husking hooks obsolete, but the equipment that Walt obtained through the purchase would prove invaluable as he developed his own products later on. Several products were offered for sale over the next several years, including toecaps for safety shoes, dental clasps and CLAM-PONN egg case cover fasteners.[3] Walt Behlen devised his egg-case cover innovation as a result of his experience on the platform of the Express Company. He found that the wooden crates were often ruined when they were pried open, and noticed that a better fastener would allow the crates to be reused. In 1940, after spending fifteen dollars a month in advertising in a poultry journal, Behlen discovered that he could sell as many fasteners as he could produce. He quit his steady day job at the Express Company in order to devote his time to industry.[4] His father became his full time partner in this business around the same time, and Ruby was responsible for all the of the bookkeeping duties.

During World War II, when rubber was scarce, Walt improvised substitute rubber rollers for mechanical cornhuskers out of old automobile tires. The Behlen Manufacturing Company netted $40,000 producing them in 1944. While many small companies grew exponentially during the war by taking on government contracts, Behlen's company did not. The only contract the Behlen Manufacturing Company had with the military was for stamped metal fuselage fittings for B-29 bombers for the Glenn L. Martin bomber plant in Bellevue, Nebraska in 1945, which accounted for only 5% of their sales.[5]

Many innovations would follow on the heels of the CLAM-PONN fasteners, including other products that were intended to aid the farmer. From his experience on his family's farm, Behlen knew that mechanical innovations could greatly ease the farmer's labors and improve agricultural production. Rains that came late in the growing season could be disastrous for a corn crop. Feed corn was left in the field as long as possible in order to ensure that it was properly dry before being placed in wooden corn cribs, where any remaining moisture could cause mold and the loss of a portion of the crop. Behlen's solution was to roll strips of mesh wire into tubes, and insert the tubes in a mass of drying corn ears. The tubes were attached to a motor-driven blower to force dry air through the corn, drying the cobs while they were being stored.

Corn dehydrators proved so popular, the machines were back-ordered by September 1946, and his usual work force of forty employees increased to more than one hundred workers producing dryers on a three-shift, twenty-four-hour-a-day rotation.[6] After only a few years in operation, the Behlen Manufacturing Company already provided a significant number of jobs to a town with a population of 8000. By 1946, the Behlens had small factory sites in five different buildings in downtown Columbus. When a large factory building where all of the products could be manufactured under one roof became highly desirable, Behlen found that a group of Columbus businessmen had made the acquisition of land for a factory a simple matter. A group of town leaders noted that with the mechanization of farming processes in Platte County fewer workers were needed on farms, and Columbus would need ample employment opportunities in order to keep displaced farm workers from moving away in search of other opportunities. They formed Industries, Inc., and purchased a surplussed tract of land that had been owned by the federal government for use for industrial development. Each factory site was laid out with electric power, natural gas and railroad access, and sold for $500 per acre.[7] Walt Behlen was the first applicant, and with $140,000 borrowed from the Reconstruction Finance Corporation, the new factory was built in

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[2] "Farm-Belt Inventor," *Fortune*, April 1953, 168.
[3] William H. McDaniel, *Walt Behlen's Universe* (Lincoln, Nebraska: Board of Regents of the University of Nebraska, 1973), 40.
[4] William S. Dutton, "These Farm Inventors Made a City Boom," *Popular Science Monthly*, March 1955, 123.
[5] McDaniel, 44.
[6] McDaniel, 51.
[7] Dutton, 122.

1946.[8] Within another two years, the company tripled its output, doubled its workforce, and was able to pay off the RFC loan.[9]

The Behlen Manufacturing Company began making corrugated steel mesh farm gates in 1946. The corrugation of the metal provided enough strength to the steel wire that the gates required no additional framework to give them extra strength or stability. In 1947, Walt Behlen adapted the design of the farm gate by making larger panels of steel mesh, corrugating the panels more deeply for even greater rigidity, and joining panels together to create a large, rectangular corncrib. The corncribs became very popular with farmers, as they were extremely simple to erect and easy to maintain. During the summer of 1949, Walt Behlen was ready to take the idea even further: if corrugated wire mesh was strong, corrugated steel panels would be even stronger and have more potential uses.[10] Walt asked his shop workers to bend a 16-gauge (1/16th of an inch thick) panel of steel, eight feet long, using the same process that was used with the mesh panels. Placing the panel on sawhorses that supported only the sides, they proceeded to pile 3,000 pounds of 5/8-inch diameter steel rods on it. Behlen discovered that the panel, which could not even support its own weight when flat, could easily support one and a half tons when corrugated. More research and development followed, and soon the first 50 by 200 foot building was constructed of the material. It was generally felt that the building would require tie rods at the eaves to provide support for the building, but when all mechanical efforts to move two walls that were three inches out of plumb failed, they discovered that the entire roof acted as a monolithic unit of the walls and simply added further strength to the building as a whole.[11]

Structural engineers doubted the heartiness of the design, and several insisted that the building would not be able to support its own weight, let alone the weight of grain placed inside. To ensure that they were not correct, the Behlens experimented extensively to determine the precise pattern of corrugation that would yield the most tensile strength. The best pattern was a 7-½ inch deep, multiple-stepped series of bends that in profile looked like half of a honey-comb.[12] They found that the panels could be manufactured quickly and economically by cutting the panels from a long coiled strip using a cutoff die, then feeding the panels though a cold-rolling machine which would create the necessary series of corrugations. Walt Behlen called his invention a "stressed-skin monocoque" frameless steel building. According to *Webster's New Collegiate Dictionary*, "monocoque" refers to a type of construction in which the outer skin carries all or a major part of the stresses of bearing the weight of the building. Over the course of the years, the methods of corrugating the metal sheets would evolve. The original "Fluted" stressed-skin panel was corrugated in waves 7 ½ inches deep. The Fluted panels were joined by the "Bold Line", a structurally versatile panel that used corrugation patterns 4 ½ inches deep, and the "Colonnade", which used three-inch deep corrugations.[13]

The first public showing of a building made of this material was held at the Behlen factory on June 22, 1950. Walt Behlen had devised a remarkable test of the strength of the 10,000 square foot building; he suspended sixteen brand new International Harvester Farmall Model M tractors from the building's roof ridge member by cables. The combined weight of the tractors amounted to over 64,000 pounds.[14] The building held firm, and representatives from steel mills, building

[8] "Farm Belt Inventor," *Fortune,* April 1953, 168.
[9] McDaniel, 54.
[10] McDaniel, 61.
[11] McDaniel, 63.
[12] McDaniel, 65.
[13] "Structural Metal." Brochure, Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.
[14] McDaniel, 67.

firms, architects, engineers and dealers from all over the country were on hand to witness it.[15] Walt Behlen already saw many potential uses for his new building. He stated,

> For the farmer it appeals as a machine and implement shed, for grain bins, stock shelter or storage house. Its industrial uses will include garages, warehouses, stock rooms, parking buildings, skating rinks, auditoriums and airplane hangars.[16]

By 1955, 125 of these frameless buildings had been built in more than a dozen states for many purposes, as Walt Behlen predicted, including factories, warehouses, barns, churches, and even public schools.[17] In 1955, the largest, 100 by 552 feet, was built as a warehouse at the Union Stockyards in Omaha.[18] Behlen buildings were adaptable according to the needs of the client. Walt advertised that his buildings could be fabricated according to a customer's specific requirements. The panels were standardized, but could be assembled in any fashion that satisfied the buyer.

Purchasing a stressed-skin monocoque building for use in agriculture or industry had distinct advantages over constructing a frame building. The frameless buildings literally have no support columns in the walls or in the interior space, and no support members for the roof aside from a ridgeline post. All of the space inside one of these buildings is available for storage. The buildings were rigorously tested and were found to be sufficiently strong to withstand heavy snow and wind loads. The buildings' materials were compactly shipped. Materials for a 60 by 100 foot building would occupy only a small portion of a semi-trailer, therefore shipping costs were exceedingly low. All the materials came with all necessary bolt holes pre-punched at the factory, ensuring a perfect fit and easy erection. In fact, only two tools were required for assembly: a hand or powered screwdriver and a wrench to tighten the bolts. All the joints were sealed with synthetic rubber, to ensure perfect weatherproofing. Should the building need to be moved, one had only to remove all the bolts to disassemble the building, and move it to a new site for reassembly.[19] Since the buildings were modular and prefabricated, adding additional space with more Behlen materials was a simple matter. Indeed, the buildings' designs and materials were so simple to erect, that a man could conceivably assemble one by himself. In Central City, Nebraska, a parish priest built his own Behlen church in 1953. Father Ignatius Spenner built it from the ground up in one year without the aid of a building committee, working on it whenever he was not tending to his clerical duties. The only work he contracted out was for heating, plumbing and electrical work.[20] Judging from the photographs of the interior, the vast majority of that year was used in finishing the inside.

By the time the warehouse at the Union Stockyards was built in Omaha in 1955, the Behlen Manufacturing Company had discovered the benefits of using aluminum over steel, although steel was still available. Aluminum is a lighter weight metal, and while it is amply strong when corrugated, it is light enough that it made shipping more affordable. The lighter weight of the aluminum also made the pieces easier to work with in the factory, and almost effortless to erect by the customer. In addition to ease of construction and shipping, aluminum had further benefits. Aluminum is immune to rust,

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[15] "Behlen Idea May Revolutionize Steel Building Construction," *Omaha Sunday World-Herald*, 4 June 1950.
[16] *Ibid.*
[17] Dutton, 125.
[18] "Wide Open Spaces." Brochure, Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.

[19] "New Frame-less (Monocoque) Aluminum Pre-Fab Opens Up New Horizons in the Building Field." *The Aluminum AcSELLerator*, Reynolds Aluminum, 18 April 1952. Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.
[20] "Central City Priest Buildings Own Church," *Omaha Morning World-Herald*, 23 May 1953.

and would require no protective coating to ensure the building's longevity.[21] Reynolds Aluminum Company was pleased to speak of the virtues of Behlen's aluminum frameless buildings, and advertised to its distributors

> Using a handful of bolts in place of the massive framing structures considered *de rigeur* by ordinary methods, the monocoque aluminum pre-fab recently unveiled by the Behlen Manufacturing Company...rises into the air with about as much visible support as the average strap-less bathing suit.[22]

Walter Behlen was not the first manufacturer to develop an all-metal building. Butler Manufacturing Company, established in 1901, had been building metal buildings in some form since 1910. In 1939, two engineers at Butler developed a rigid frame metal building, and a complete line of them was available by 1940. Butler had a strong line of rigid frame, pre-fab corrugated metal buildings available on the market for a decade before Walt Behlen devised his innovative corrugation method, but which would prove stronger? Behlen's monocoque steel buildings would receive an opportunity for the most extreme of stress tests in 1955. The Atomic Energy Commission (AEC), in cooperation with the Federal Civil Defense Administration (FCDA), devised a series of tests to determine the effects of an A-bomb detonation over a mock community, which they named Survival City, at Yucca Flat in Nevada. Two Behlen buildings were included in the test; one was situated 6,800 feet away from ground zero, while the other was placed 15,000 feet away with the rest of Survival City. On May 5, 1955, both Behlen buildings survived the blast of a thirty-kiloton atomic bomb, a bomb fifty percent more powerful than the bombs dropped on Hiroshima and Nagasaki.[23] *Popular Science Monthly* reported the results of the test in its July 1955 issue.

> ...A novel structure made by the Behlens...had had the front of its roof deeply dented and its sides noticeably poked; window frames were empty and its wood door had been split into kindling. But, the building still stood firm and ready to provide shelter.[24]

Steel buildings made by Walt's two competitors, Butler and Armco, flanked the building nearest the detonation point. Neither building survived the blast in serviceable condition. Both buildings looked like twisted and shredded tin cans. Behlen's buildings were returned to Nebraska. One was placed on display at the State Fair of 1955, and later returned to the factory for public display and was painted an "atomic orange." The other was given to the University of Nebraska at Lincoln. The buildings' survival in a test of this magnitude provided incalculable publicity, and sales of the frameless steel buildings soared. The Behlen company further took advantage of the free publicity by developing a line of family bomb shelters and community fallout shelters. By the end of 1955, the Behlen Manufacturing Company had recorded a total of $3.5 million dollars in sales, the highest in the company's history.

In 1956, the Behlen Manufacturing Company developed a method of fabricating curved corrugated metal panels that were just as strong as the flat corrugated panels. These panels could be used for making curved roofs on storage buildings, and even Quonset-style buildings which the Behlen company called "Curvets."[25] Like semi-curved roofs over barn hay mows, these curved buildings maximized storage space. In addition, the company would later develop a method of creating flat roofs (Dubl-Panl roofs) that required no columns to support the weight of the roofing members. A Dubl-Panl

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[21] "New Frame-less (Monocoque) Aluminum Pre-Fab Opens Up New Horizons in the Building Field." *The Aluminum AcSELLerator*, Reynolds Aluminum, 18 April 1952. Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.

[22] *Reynold's "Aluminum Progress,"* December 1952, 5.

[23] McDaniel, 81.

[24] McDaniel, 67.

[25] McDaniel, 13.

flat roof could be built to cover a span of more than 300 feet in width, and could be cantilevered over a wall to create an overhang requiring no supports.[26] Curved Dubl-Panl roofs could be used to span over 1,100 feet, also without the use of supports, which would restrict the free use of the space. In advertising for the new Dubl-Panl roof systems, the Behlen company proposed that the roofs could be used for space age hangar facilities, immense fair and exposition centers and convention halls, or even covered ship yards, all built on a colossal scale, espousing the unlimited potential of the product.[27]

Each innovation in design allowed for more utility and a varied product line. Over the years, Behlen products have grown to include everything from car washes and simple "Spartan Shops", to gigantic grain elevators and auditoriums. For a time, the company produced family- and community-sized underground bomb shelters that exceeded standards set by the Federal Civil Defense Administration. Although the product line would grow to include products intended to house many types of commercial, industrial and even social activities, the company's primary interest was in providing quality products to aid the American farmer. Because of the high quality of the Behlen Manufacturing Company's varied agricultural products, Behlen's stressed-skin monocoque steel buildings of every type are found across the Nebraskan agricultural landscape. A drive down U.S. Highway 30 would illustrate the point. From Kearney to Kimball, the landscape along the highway is punctuated every few miles with a Behlen building of one stripe or another.

The Behlen Manufacturing Company remained in Behlen family hands until it merged with the Wickes Corporation of Saginaw, Michigan, on March 14, 1969. Though this nomination primarily mentions the contributions of Walt Behlen to the Behlen Manufacturing Company, it is important to mention that his father and his brothers Mike and Gib remained active in the family business as well, serving in both leadership roles and product development. Still, Walt Behlen was the initial driving force behind keeping the company afloat in the 1930s, and was responsible for many of the major inventions and innovations that encouraged the company's growth over the years. The company excelled due to Walt's vision, innovation, and tireless efforts. Though the company eventually hired engineers who were academically trained for their craft, Walt Behlen's scientific curiosity would ensure that he remained a major player in the company's research and development.

Behlen's scientific curiosity was not limited to research and development for the company, however. Walt was fascinated with energy and read scientific journals avidly. In 1939, he read a *Popular Mechanics* article regarding the possibility of obtaining energy from uranium atoms. After atomic bombs dropped on Hiroshima and Nagasaki, the truth of that possibility became apparent, and he began to read everything he could find on the subject. On December 23, 1947, he wrote a letter to the Los Alamos Laboratory detailing his ideas regarding the possibilities of creating a hydrogen bomb using a deuterium trigger. The director of Los Alamos replied to him on January 8, 1948, indicating that while he could not comment directly on any projects they may be working on, he would make sure that careful attention would be given to Behlen's suggestions. When news reports stated that the U.S. government was indeed working on such a bomb, Walt had cause to wonder if he had had a hand in its development.[28] When the Atomic Energy Commission began testing hydrogen bombs at Yucca Flat, Walt was more than pleased to be able to enter his buildings as participants in the test. However, he was even more proud that his previous course in radiological monitoring, which he had taken due to his interest in atomic energy, qualified him to be appointed as the radiation dosage control officer for the commercial buildings group of the 1955 test. He was granted a Q clearance, which allowed him access to most controlled areas of the test site.

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[26] McDaniel, 110.

[27] "Beneath a Steel Sky." Brochure, Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.

[28] McDaniel, 236.

Walt Behlen was also interested in astronomy and the possibilities of space travel. His family had a ten-inch reflective telescope at their home, and frequently studied the craters on the moon and gazed at the stars. But merely looking at the stars did not satisfy Walt; he preferred to contemplate the conditions and circumstances under which humans could travel between them. He made extensive studies into the speeds at which celestial bodies moved through space, and the technologies that would be required to shake the dust of earth off his feet. He was convinced that technology was improving to the point where Americans would be able to send a ship to the moon and return to earth within twenty years. He publicly predicted the lunar landing at a public meeting of the Lions Club of Columbus on January 12, 1948. Had it not been for the disastrous launch pad fire of Apollo I, his prediction would have been precisely on target; as it was it took twenty-one years for NASA to accomplish the landing.[29] Walt Behlen was a renaissance man. He used his scientific and engineering knowledge to invent and improve products at the factory, but he also nurtured a life-long interest in all types of scientific endeavors.

Criterion C:

The Walter and Ruby Behlen house is a representative example of the versatility of Behlen's monocoque steel products, if not a typical example of the common uses of the products. By 1957, as Walter was contemplating the construction of his new home, it must have occurred to him that his new residence could be a showcase of the possibilities of working with his company's corrugated steel products. The Behlen Manufacturing Company had long advertised that Behlen buildings could be perfectly customized to suit any purpose and fulfill any order. Constructing a luxurious home of the material would prove its potential in any arena, and using rich materials such as rare Burmese teakwood and green stone from Mount Shukson, as well as designer treatments for the walls, floor and furniture, would go a long way in illustrating its potential. Perhaps trying to shake the product's agricultural and industrial image and prove the material's versatility, he contracted with Leo Daly architects in Omaha, one of the largest architectural firms in the world at the time, to design a large house using his steel materials, as well as some of the finest wood and stone building materials available. According to Behlen's family, Walt wanted the validation of a known architectural firm to build his new house with modern, industrial materials. Jack Savage was the principal architect on the project. While Leo Daly, the architect of record, did all the drawings and formal plans, the Behlen Manufacturing Company did all the engineering in house.

Behlen intended the house to be used extensively for entertaining, and the plans required that the spaces be open and useful for intimate, as well as large, parties. The house is so perfectly designed for entertaining that the Behlens hosted their daughter's wedding reception in the house. Walt devised a platform to be placed over the swimming pool to utilize all the space available in the poolroom, and 500 of their guests were able to comfortably enjoy the occasion and the house's charms. But the house was not designed just for entertaining friends. It was built to be a show piece for the Behlen Manufacturing Company's best selling product, corrugated steel panels. It was a life-size model of the possibilities of designing in steel. Potential clients and business contacts were given opportunities to be witnesses to the scale and luxury of a home made with industrial steel panels. Several wrote Walt and complimented him on his lovely home after a visit. William L. Thompson, a radio network salesman for the National Broadcasting Company, Inc., wrote Walt a letter thanking him for his hospitality and mentioned the innovation involved in the design of his home before the Behlens ever moved in.

[29] McDaniel, 233.

> What a thrill it will be for you folks to move into that beautiful new home. I have taken tours through some grand domiciles in my day but have never seen so many new and revolutionary ideas as you have incorporated in yours. And I know you are the type of person who will have "open house" for all Behlen people and those of us who do business with you frequently in the future.[30]

Indeed he did. It seems certain that more than one guest found the house to be indescribable in its innovation. After a visit, Howard Pyle of the National Safety Council also wrote Walt in praise of his new home.

> You will be interested to know that I have tried to describe your home to the members of my family. Long before I finished the details as I remembered them, I decided that they would simply have to see it to believe it. It is really something and I congratulate you for the originality involved and for the rather extraordinary livability that you have been able to build into something so completely unique.[31]

The Behlen House is the best property that represents the life and work of Walter Behlen, inventor and entrepreneur. While examples of his monocoque steel agricultural buildings are ubiquitous throughout Nebraska and other parts of the United States, one would be hard pressed to say that one of them is a better example for consideration for the National Register of Historic Places than any other. While the factory itself may have been a good candidate for listing for its historic significance and its association with Walter Behlen, there is not sufficient historic integrity to support such a nomination. The Behlen Manufacturing Company experienced such incredible growth that it became necessary to add on to the original factory every several years to allow for further product development, eventually culminating in a need for an additional factory site outside of Columbus that was constructed in 1957. Neither factory building would make a good candidate for listing in the National Register of Historic Places in place of the Behlen House. The house represents the innovations of Walter Behlen's corrugated metal building materials, as well as his desire to exhibit his materials being used for purposes other than industrial and agricultural. The sprawling house was architect-designed, using one of the largest architectural firms in the country at the time, in order to exhibit prestige and distinction for his home and his materials.

The house exhibits exceptional historic integrity. Nothing of substance has been changed in the years since the house was built in 1958, including the interior decorations. Its outstanding historic integrity, together with its exceptional significance, make the building an excellent candidate for listing in the National Register of Historic Places for criterion B for its association with Walter Behlen and criterion C for its architectural significance.

Criterion Consideration G is met through the exceptional significance of Walter Behlen and his innovative building designs. Behlen and his innovations have changed the character of the mid-western rural landscape in the past fifty

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[30] William L. Thompson, National Broadcasting Company, Inc., Radio Network Sales, to Walter D. Behlen, 12 May 1958. Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.

[31] Howard Pyle, National Safety Council, Chicago, to Walter D. Behlen, 13 March 1959. Walter D. Behlen Collection, Library/Archives, Nebraska State Historical Society.

years. Where once frame barns and outbuildings were the norm, metal Behlen buildings have taken their place. Additionally, the original and exceptional design of the Walter and Ruby Behlen House illustrates the important nature of the Behlen style. The industrial/agricultural nature of Behlen's design lent itself well to a classic 1950s style of residential architecture. There is no question that as a representation of Walter Behlen himself and his company, the Walter and Ruby Behlen House has gained exceptional significance within the past fifty years. Constructed forty-five years ago, the Walter and Ruby Behlen House is just shy of the arbitrary fifty year cutoff. This cutoff is intended to ensure that sufficient time has elapsed to develop historical perspective and to evaluate significance. In the case of Walter Behlen and his house, forty-five years is sufficient time to develop this perspective.

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Verbal Boundary Description:

South ½ of lot 7, all of lots 8 and 9, portion of the west 40 feet of lot 10, and a triangular tract on the southwest corner of lot 5, Block B, North Park 1st Subdivision, Columbus.

Boundary Justification:

The boundary includes all of the land historically associated with the Walter and Ruby Behlen house.

Walter and Ruby Behlen House
PT01-538
Columbus, Platte County, Nebraska

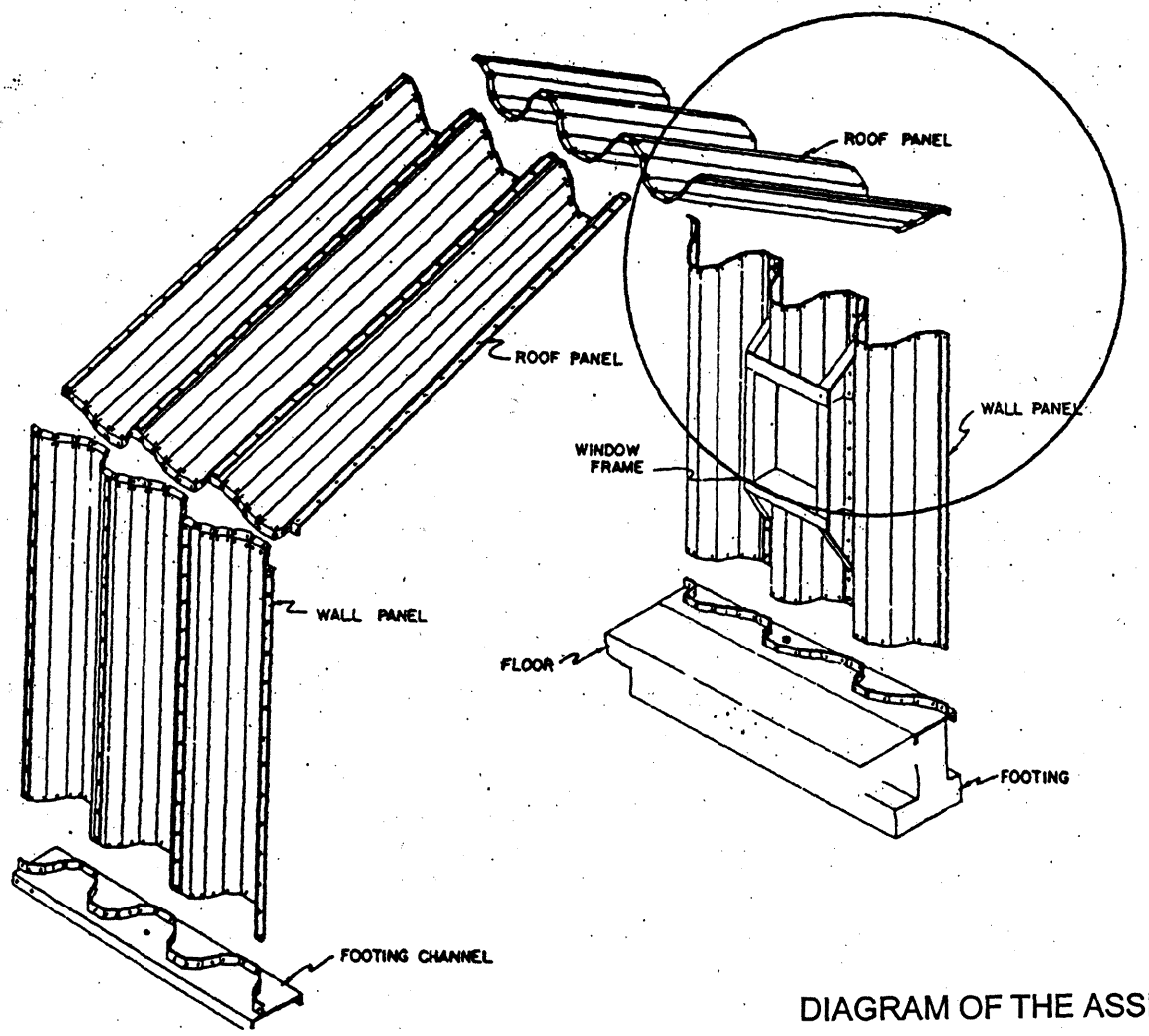

DIAGRAM OF THE ASSEMBLY OF BEHLEN MATERIALS

Diagram shows how side and roof members are joined by bolted connections to form continuous self-supporting arch.