stelco

Scope

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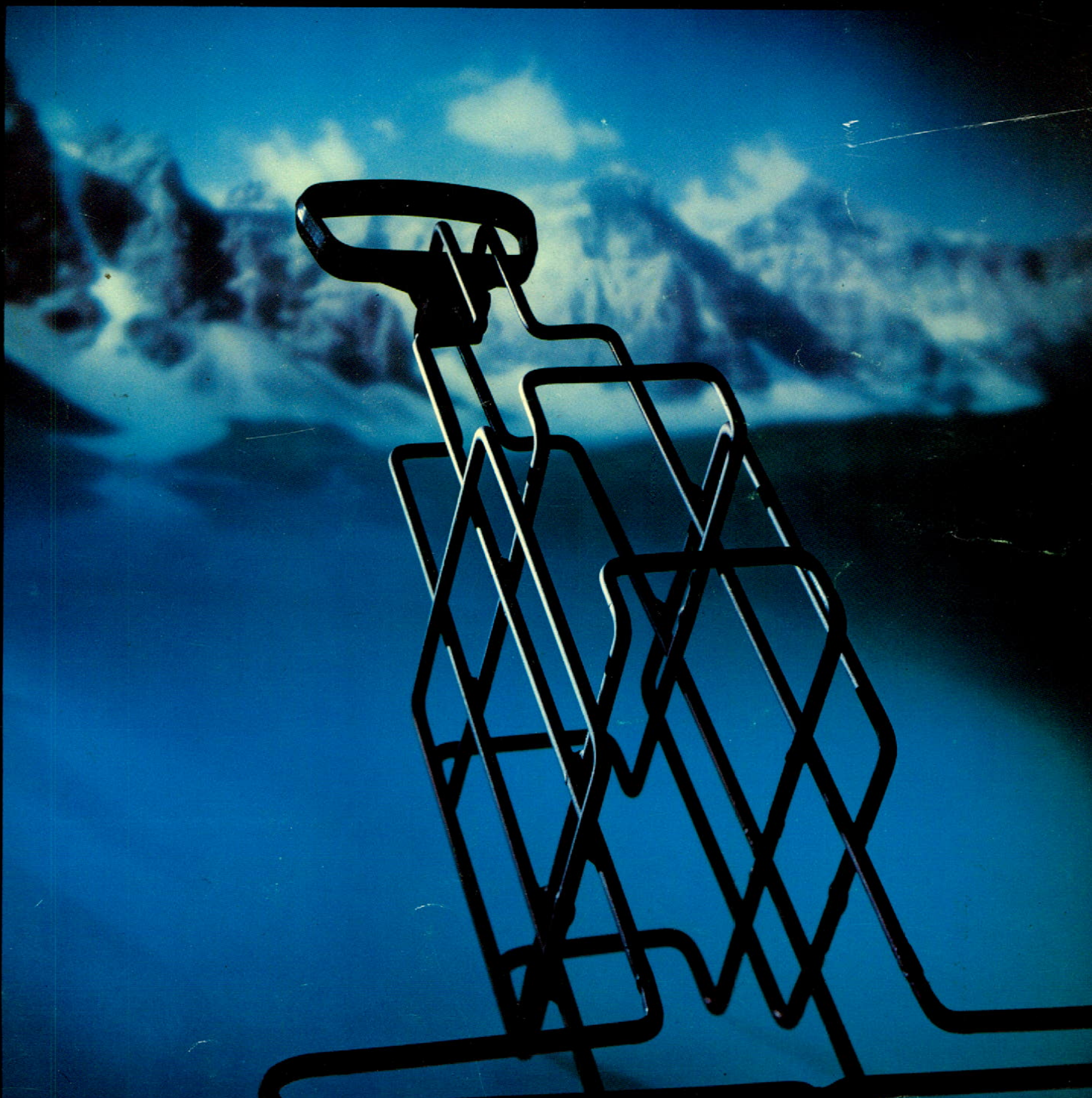
The Scope of Steel



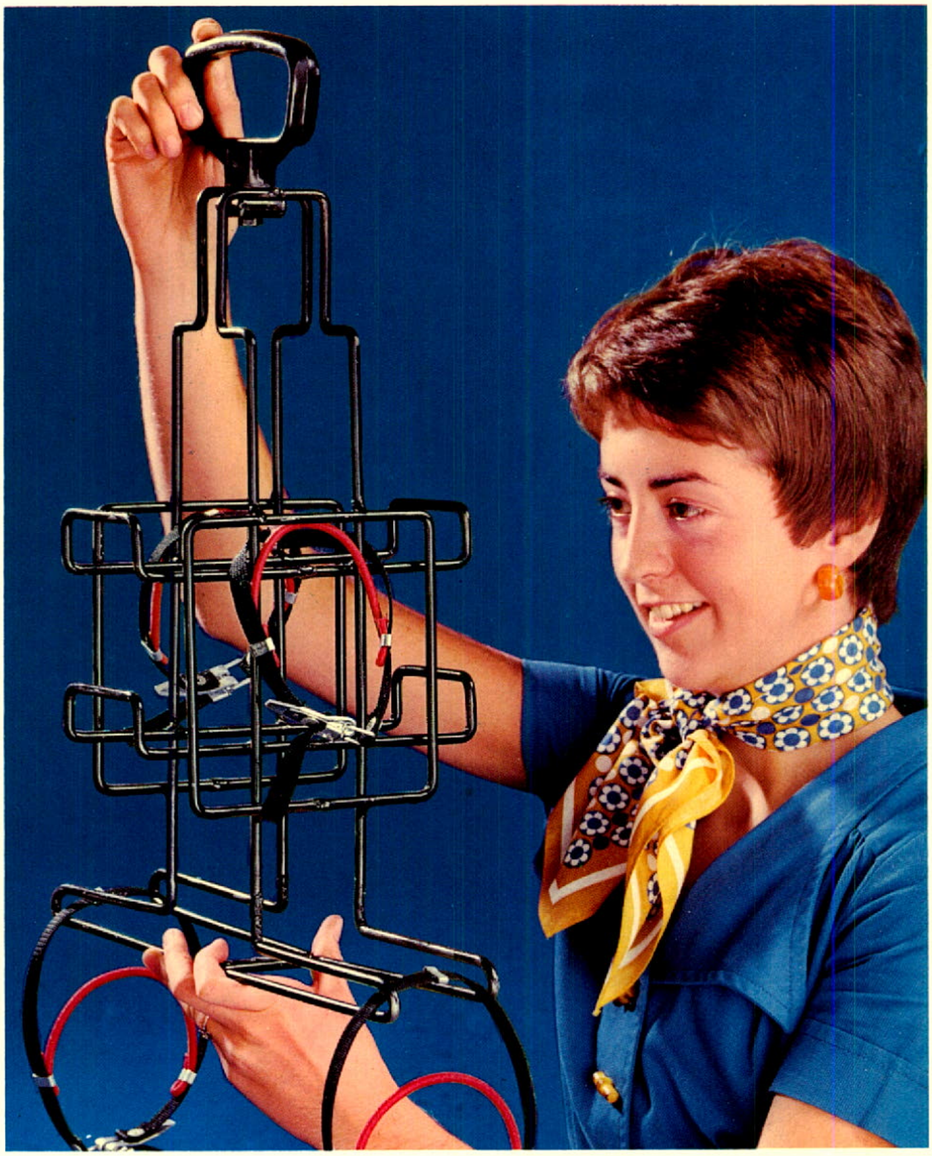
McMaster student wins with wire in the USA

In 1976 the AISI (American Iron and Steel Institute), through the Committee of Rod and Drawn Wire Producers, sponsored the first annual Design with Steel Wire Competition. The finals took place in New York City and the grand prize was immediately whisked across the forty-ninth parallel by a twenty year old student at McMaster University, Hamilton, Ontario: Leslie K. MacLeod of Thunder Bay.

The winning design? A ski equipment carrier fabricated from steel wire that contains skis, poles and boots on one convenient holder. The designer approached the problem pragmatically. In the words of her report to the AISI:

'In order to provide a solution, the design should:
be uncomplicated to operate
be easy to transport for skiers of all ages
be adaptable to different sizes of equipment
be strong enough to support the combined weight of skis, ski poles, and ski boots of various sizes
be adaptable to different means of transportation, e.g., carrying by hand, transported on cars, shipped by plane or train.'

The evolution of the design is seen in Ms. MacLeod's sketches. All are steel wire concepts, and all are 'skeletonizations' in which material is used only where it is needed, resulting in low cost, simple production and minimum weight. The final design permits the user to carry skis, poles and boots, in one hand. Her report continues:

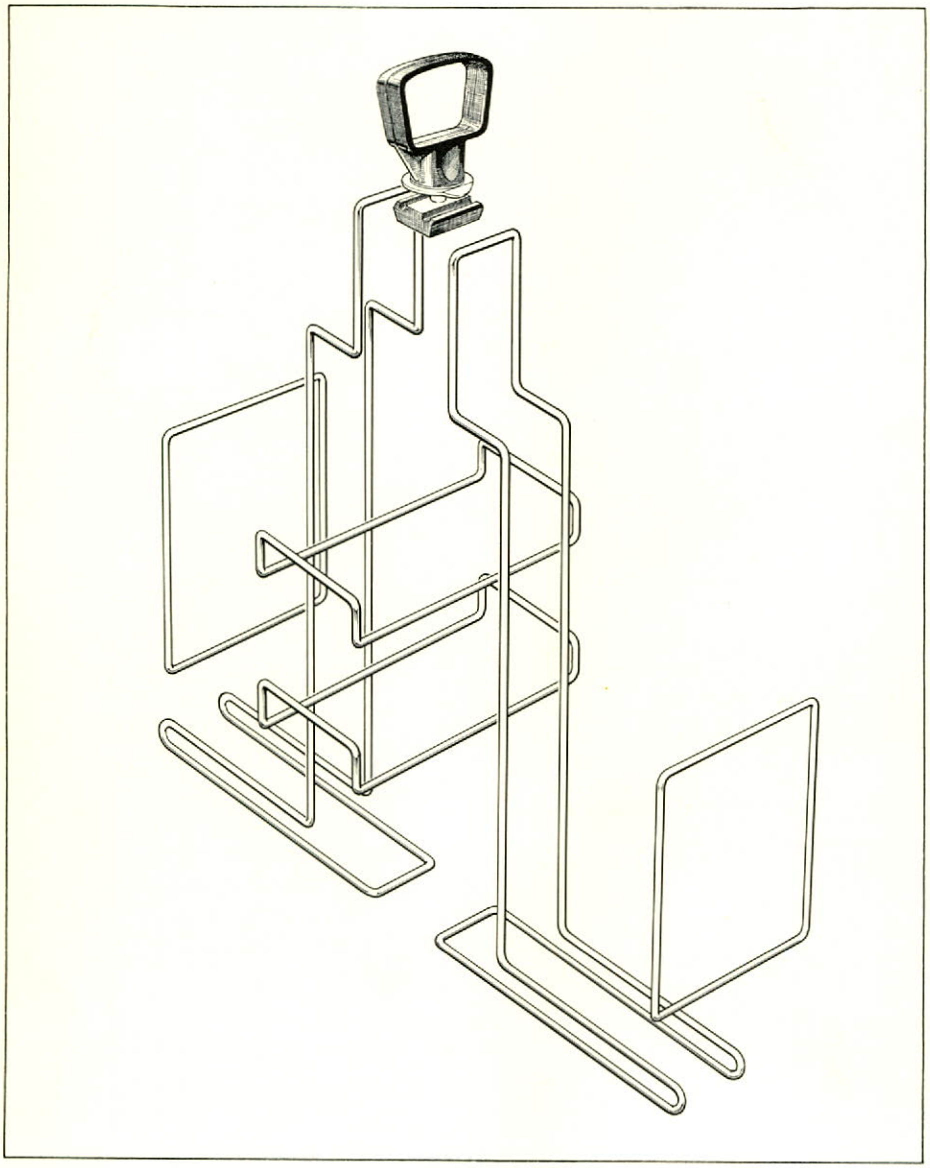


The imaginative steel wire design that won Leslie K. MacLeod of Thunder Bay, Ontario, an AISI award.

'Market and Product Analysis

This device has been designed with the sport of downhill skiing in mind. This has become such a universal sport that it is believed there would be a widespread market for such a device. A preliminary survey of some skiers in the Hamilton and Toronto, Ontario, areas revealed an interest in such a design. This device could also be adapted to the sport of cross-country skiing which would thereby increase the size of the potential market for such a device.

'From a production standpoint, the final design was chosen over concept #4 since this concept involved bending the wire in many different planes which is difficult to do and would thereby increase the cost. The final design, therefore, uses more welding which, from the production standpoint, is more economical. This design uses approximately 175 inches (4445 mm) of steel wire and if a great number of these carriers were built, this would present a sizeable market for steel wire.



The AISI Award-winning ski equipment carrier comprises 175 inches (4.4 m) of 0.188 inch (4.8 mm) carbon steel wire. The design puts function before aesthetics, and embodies the skeletonization principle.

'Physical Quantities

Some of the important physical quantities which affect the practicality of the proposed design include:

a) Overall Dimensions: The final design is roughly 21'' (533 mm) tall (this includes 17'' (432 mm) for the wire frame plus 3''-4'' (76-102 mm) for the handle). The width of the device is 6'' (152 mm) at the widest point and the length is 15'' (381 mm) at the longest point.

b) Overall Weight: The proposed final design is to consist of 175'' (4445 mm) of drawn steel wire which is 3/16'' (4.8 mm) in diameter. According to statistics tabulated in ''Designer's Handbook: Steel Wire'' (American Iron and Steel Institute), the weight of wire of this type is 0.09387 lbs/ft. (0.14 kg/m). Thus, for 175'' or 14.583 ft. (4.445 m) the weight of the wire would be:

Weight of wire = (0.09387 lbs/ft (0.14 kg/m)) x (14.583 ft. (4.445 m))
= 1.37 lbs (0.62 kg)

'Added to this is the weight of the handle and the straps used to hold the skis, ski boots, and ski poles on the frame. This would bring the total weight of the finished product to approximately 1.6 - 1.7 lbs (0.73 - 0.77 kg). The fact that the device does not weigh very much is one of the features which adds to the practicality of the design since it would be easy for the younger skiers to manage such a weight.

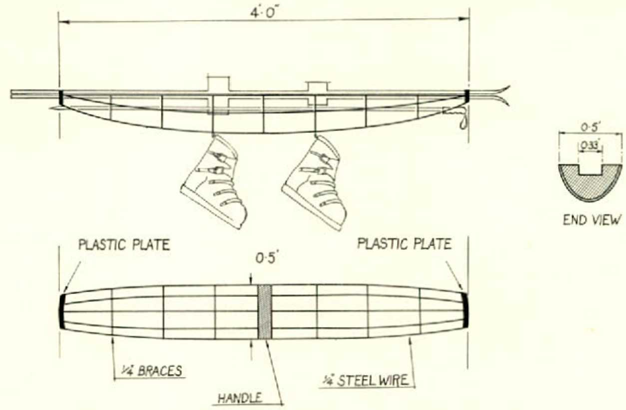
'Strength Analysis

In order to be functional, the proposed design must be sufficiently strong to support the maximum design load that can be expected. Maximum stress would be placed on the design when it was carrying the ski equipment for an average male skier due to the larger size of the ski boots. As a result, some measurements were taken of the weights of the skis, ski poles, and ski boots of various skiers and the average weights obtained were:

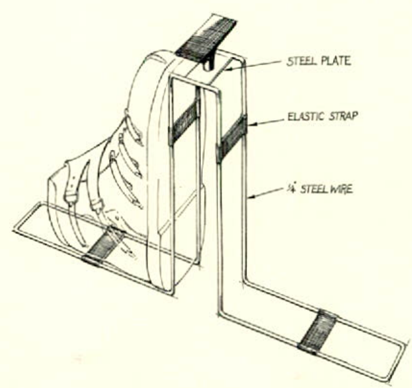
Weights

skis and ski bindings	10 lbs (5 lbs each) [4.5 kg (2.6 kg each)]
ski boots	12 lbs (6 lbs each) [5.4 kg (2.7 kg each)]
ski poles	2 lbs (1 lb each) [0.9 kg (0.5 kg each)]
Total	24 lbs (10.9 kg)

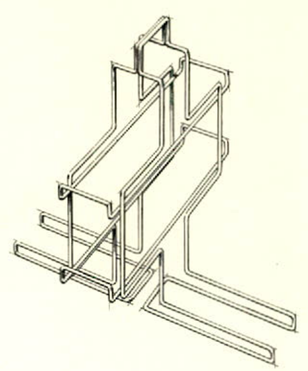
Preliminary Concept 1



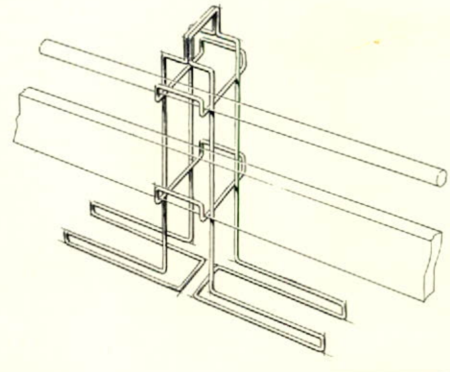
Preliminary Concept 2

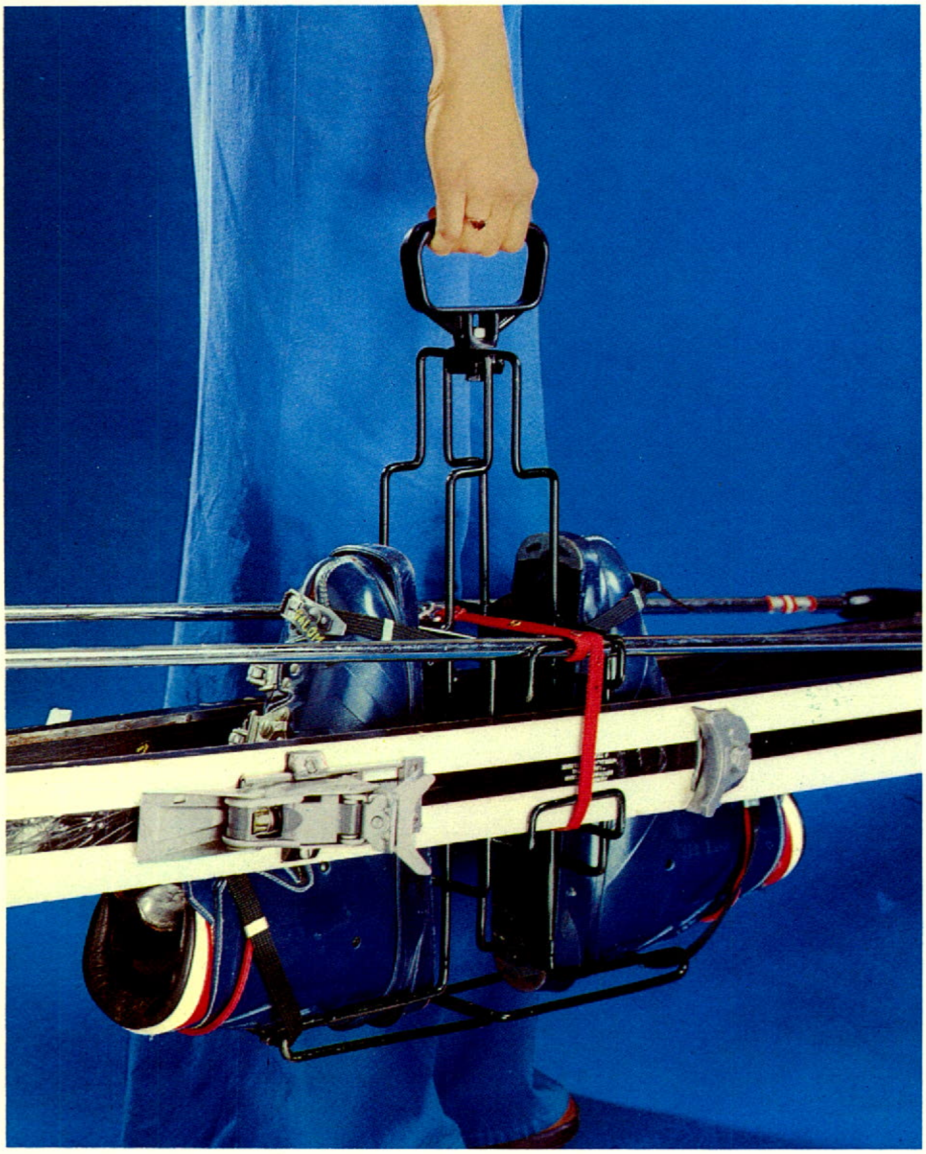


Preliminary Concept 3



Preliminary Concept 4





'According to values tabulated in an article "New Concepts in Wire Design" by Titchener, the tensile strength of 3/16" (4.8 mm) diameter wire is 70 000 to 100 000 psi (483 to 690 MPa) therefore the proposed design is seen to be capable of withstanding a 24 lb (10.9 kg) load. The main points of stress would be the points at which the cross braces designed to hold the skis and poles are welded to the wire frame. There is also some stress on the base of the frame where the ski boots rest, however, this would not be as major a factor in stress considerations since this load is distributed over a larger area of steel wire. The type of welding used in making the prototype of the design was resistance spot-welding which is quite capable of withstanding the loads to which it will be subjected and also will be able to withstand the temperature changes which will take place during the use of this design.'

'Conclusions

. . . it is felt that the refinement and development of the initial concepts led to a final design using steel wire, which provides a feasible solution to the design problem, as stated at the onset of this report.'

Ms. MacLeod fabricated the prototype by hand, hammering the vise-held steel wire into the required form.

Douglas Smith, Assistant Professor, Industrial Design in the Engineering faculty is fully committed to the relevance of his discipline: "I'm here to teach design, not engineering. It is felt, within the faculty, that the optimum individual would have the facility to appreciate the aesthetics and human factors, the durability and marketing potential of a design, yet at the same time have the engineering and technical background to implement them.

"We currently have a three year grant from DESIGN CANADA, Department of Industry, Trade and Commerce. We are very encouraged by this success in our first year. Needless to say, we shall enter the competition again next year."

The Stelcolour Spiral

It takes a pipe to protect a pipe. And Stelco is supplying Shaw Pipe Protection Limited of Rexdale, Ontario with Stelcolour prefinished steel to do just that.

Shaw Pipe Protection provides insulation systems for above ground pipelines. Many of these are in the Arctic, and Stelcolour steel jackets not only offer strength and protection, but also a means of colour coding. A typical application is at the exciting Strathcona Sound mining project at Baffin Island, 2000 miles (3218 km) north of Montreal. It's cold! For over two months a year the Arctic sun doesn't even clear the horizon. Insulation for the above ground pipes *has* to be efficient.

Shaw calls its above ground insulation system 'Spiral-8'*. The system can be used with metal, plastic or asbestos cement pipe. It is designed to satisfy a wide range of thermal requirements: from freeze-protection for Arctic gathering systems, to prevention of heat loss in hot oil lines. The insulation 'tubes' are plant fabricated to required length and any outside diameter up to 4 feet (1.2 m). The insulating medium is rigid, void-free urethane foam — with excellent thermal efficiency and compressive strength.

The foam is encased in a jacket of Stelcolour prefinished steel ranging from 0.016 to 0.052 inch (0.4 to 1.3 mm) thickness. The Stelcolour steel jacket is continuously formed and jointed in a spiral pattern. The joint used is a high strength, pressure grooved, single lock waterproof seam. This provides a continuous seal and vapour barrier of considerable mechanical strength.

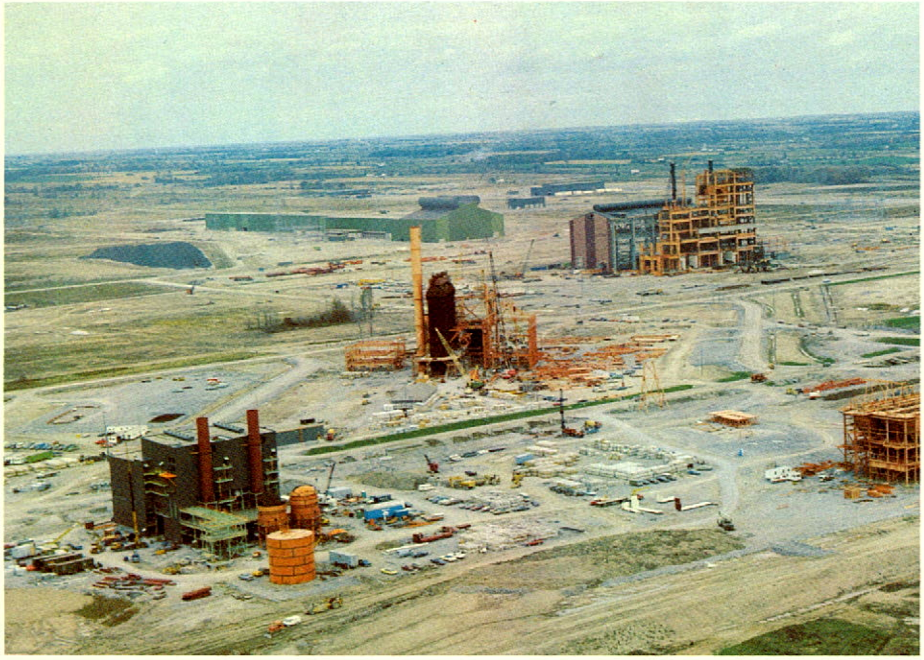
To facilitate field installation, premolded urethane half shells are provided for welded 'L' and 'T' joints. Shrink sleeves and the Stelcolour steel jacket complete the protection. The entire installation of the Spiral-8 can be easily achieved in extreme conditions without specialized equipment or crew training.

The 'Spiral-8'* joint is a high strength, pressure grooved, single lock waterproof seam. It provides a continuous seal, and vapour barrier of considerable strength.

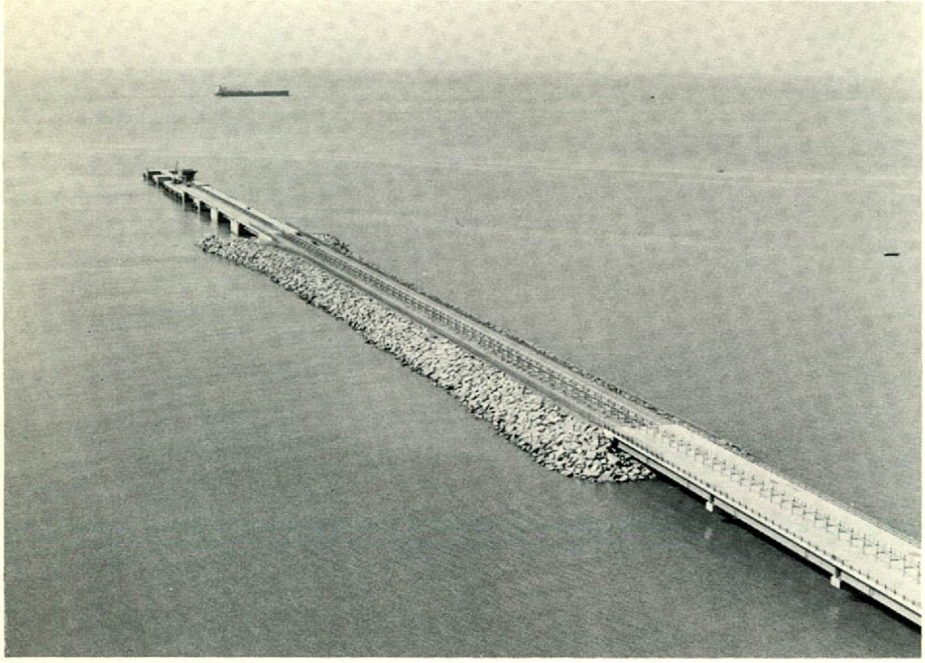
Line pipe destined for above ground use in the Arctic, is jacketed in Stelcolour steel for protection and identification purposes, and shipped from Montreal.

*Registered trade mark

LED: A dream becoming reality



Stelco's Lake Erie Development. The central boiler station, hot strip mill, blast furnace, BOF/caster complex, and blast furnace stock house show good progress. The ultimate goal is to double the company's steelmaking capacity.



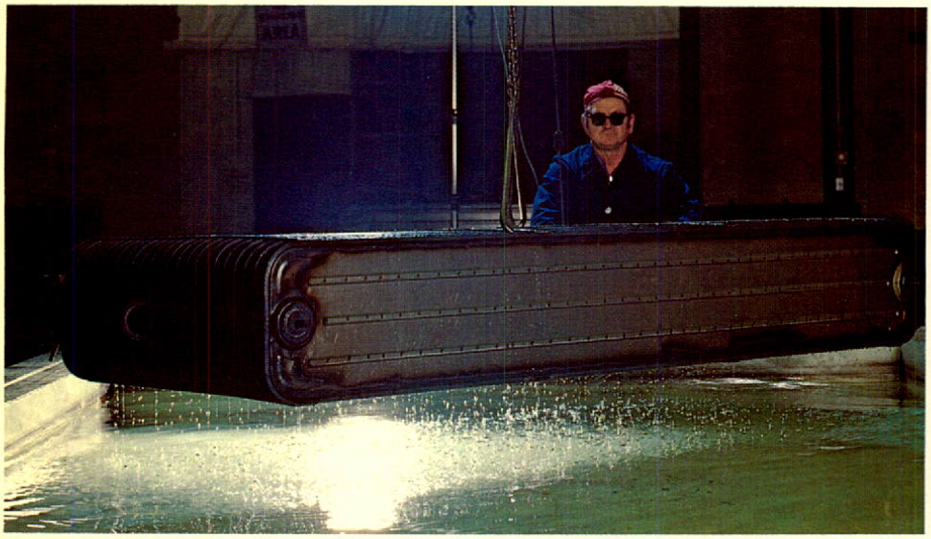
The raw material receiving dock is complete. Here, lake freighters will discharge their loads which conveyors will take, under nearby Lakeshore Road, to a rail-mounted stacker located within the plant.

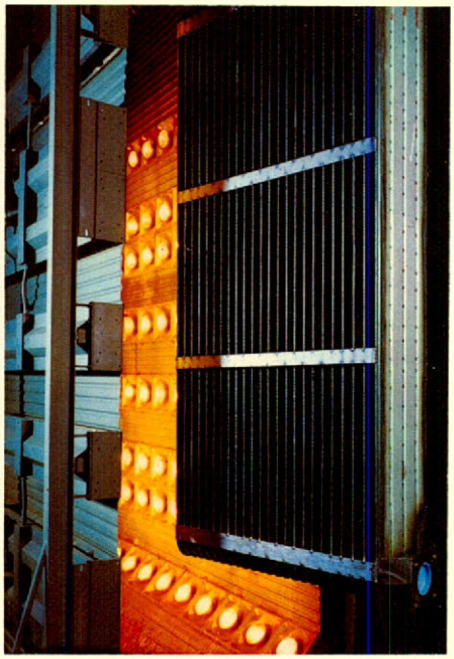
The largest single venture ever undertaken by the Canadian steel industry is rapidly taking form on the north shore of Lake Erie.

LED — Stelco's Lake Erie Development — a 6600 acre (2671 h) greenfield site destined to accommodate a brand new fully integrated steelmaking complex, is located near Nanticoke, Ontario. There on the shores of Lake Erie this immense project is only three years away from production. Then the first ladle of molten steel will leave the basic oxygen furnace (BOF) shop, headed for the slab caster. From there specially designed unit trains, comprising cars with racks capable of carrying six 20 ton (18 t) slabs, will convey the steel to Stelco's Hilton Works in Hamilton for further processing. And that represents the first stage of development. Subsequent stages will see the whole steelmaking process performed at Nanticoke.

The raw material receiving dock is complete. Work is also well underway on the foundations for the conveyors that will handle raw materials from the dock to a rail-mounted stacker. Foundation work is continuing for the coke oven battery, and most of the coke oven refractories are already on site. The blast furnace and stoves are well advanced now. And in the BOF steelmaking complex the first vessel is being assembled on rails south of the steel shop. The erection of structural steel for the major building complex is halfway completed and work continues on foundations in the slab casting area. And, of course, there are other areas where a variety of activities proceed. The first stage will allow the company to increase its steel output by 1.3 million tons (1 179 334 t); the ultimate goal being to double the company's steelmaking capacity to 12 million tons (10 886 160 t) per year.

Koolrad





A radiator is immersed for pressure testing purposes. Koolrad is changing the design of some rads to facilitate faster production and size reduction. The user will benefit from lower steel and oil content.

A power transformer cooling radiator passes between banks of heat lamps prior to phosphatizing. The ratio of panel surface area to coolant volume inside it, is critical to the heat dissipation process.

Transforming electrical energy generates heat. The cores of a transformer are surrounded by dehydrated oil. Heat from the cores is transferred to the oil which then needs cooling. How is the oil cooled? In steel radiators.

Koolrad Design and Manufacturing Limited of Whitby, Ontario, has been making cooling radiators for power transformers for over five years. President Rudi Kaaz explains the principles involved in cooling liquid coolants, such as oil: "Obviously the hot coolant has to be cooled outside the transformer. This is done by pumping the oil into radiators welded to the transformer tank walls; in larger units the rads would be supported separately by an A-frame structure." The radiator panels consist of commercial quality cold rolled sheet steel ranging from 0.047 to 0.104 inch (1.2 to 2.6 mm) thickness, and sizes from 10 to 15 inches (254 to 381 mm) wide by 1.5 to 13.2 feet (0.5 to 4 m) long. The gap between sheets of the same panel is usually 0.5 to 0.625 inches (12.7 to 15.9 mm), thus permitting only a small volume of oil in relation to the surface area of the panel. And, in fact, this ratio is critical to the efficient cooling of the coolant.

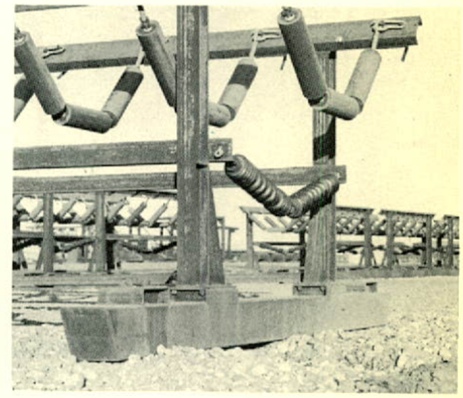
Rudi Kaaz continues: "As hot oil moves into the radiator panels, the ambient temperature increases so that hot air moves up, due to convection, and allows cold air to take its place, thereby dissipating the heat of the panels. Then the cooled oil is returned to the transformer tank. Panels are welded into 'banks' of whatever numbers are necessary to cope with the heat generated by the transformer, and in larger applications that could involve thirty or forty panels." Some rads are cooled by means of thermostatically controlled fans.

Business is booming at Koolrad. An increased turnover of one thousand percent in five years, and further expansion is planned. The company is changing the design of some rads to facilitate faster production. The change involves a size reduction that will benefit the customer, too. Less steel is needed, less oil is needed, and the result? An altogether more economical unit. And at the time of writing, Koolrad is preparing to manufacture 'header' type radiators, where the pipes carrying the coolant between radiator and transformer also support the weight of the rad. To achieve this, the steel input pipes will be of 4.5 or 5 inch (114.3 or 127 mm) outside diameter and 0.188 or 0.250 inch (4.8 or 6.4 mm) thickness. The company is also going to manufacture coil radiators for use in heat exchange units. These would be used for such tasks as maintaining viscosity in oil or asphalt bunkers, maintaining plating solution temperature, and in the heating systems of large institutional buildings such as prisons.

To expedite the increased production involved with both existing and new lines, Koolrad has installed new automative processes. These include augmenting existing oxyacetylene welding capacity with electric resistance welding, MIG (Metal Inert Gas) and TIG (Tungsten Inert Gas) welding; plus new, automatic stamping presses. Koolrad supplies across Canada and into the United States. President Rudi Kaaz is both salesman and pilot — flying the company plane to reach new customers and maintain the healthy growth rate of this highly successful Canadian company.

HSS conveyor skids

Raw tar sand is carried by conveyor belt from excavation to plant for processing — often a distance of several miles. The conveyor framework and roller systems are supported by 12 x 12 HSS, chosen for their torsional rigidity and strength to weight ratio.



When the excavation site changes, the conveyor system is literally 'skidded' to the new location on the 18 feet (5.5 m) long, 800 pound (360 kg) HSS skids. The HSS are capped to prevent intrusion of sand during skidding.

Another example of the remarkable versatility of steel Hollow Structural Sections (HSS) is seen in their use as shiftable conveyor skids for the much-publicized Syncrude Athabasca oil sands project. The reasons: torsional rigidity and advantageous strength-to-weight characteristics.

Raw tar sand is carried by conveyor belt from the excavation site to the plant for processing. This distance may be several miles. The framework and roller systems which drive the conveyor belting are supported by the HSS skids. As the site of excavation changes, the conveyors are literally 'skidded' on the HSS to the new location. Each skid is 18 feet (5.5 m) long and weighs approximately 800 pounds (360 kg). The main component is 12 x 12 HSS with a 0.250 inch (6.4 mm) wall thickness of G40.21 Grade 50W steel supplied by Stelco's plant in Welland, Ontario. Fabrication of the skids is the responsibility of Saskatchewan Steel Fabricators Limited of Regina and is carried out at that company's shop in Camrose, Alberta. The HSS are saw-cut to form inward-sloping ends which are then capped to prevent the intrusion of sand during 'skidding'.

Sasksteel's Marketing Manager, Gordon Goodfellow elaborates: "We set up a highly automated production line for the necessary sawing and welding operations. The order, for 4300 skids, will be produced over the period of a year. Delivery is currently geared to the customer's construction and start-up schedule, however, we are capable of producing at a higher rate if required." Mr. Goodfellow believes that in this application HSS hold a definite advantage over, say, the more conventional wide flange section. Aesthetically more pleasing, the HSS will, due to their configuration, skid better than a flange shape.

The skids are shipped from Sasksteel's Camrose plant to Hansa Iron Works near Edmonton, where the conveyor support framing is fabricated and assembled. Here, the skids are incorporated in the final assembly of the conveyor support which is then shipped by road to the tar sands.

Sasksteel, with a history dating back to 1905, became a wholly-owned subsidiary of Stelco in 1962. The company is involved in heavy plate fabrication for such products as tanks, bins, hoppers, ducting, stacks, and large piping; and ships to projects from the Lakehead to Vancouver, erecting fabricated steel at the project sites.

Stelcolour case histories

Company: GSW Metalwares Limited, Hamilton, Ontario

Product: Woodgrain waste baskets

Reasons for using Stelcolour steel: Improved product finish, production speed-up and release of paintline capacity.

Details: In February 1976 GSW re-tooled its waste basket production line to accommodate the change from post-painting with hand-applied woodgrain finish, to Stelcolour prefinished steel. The consequent capital cost outlay has been more than justified. Since the change, waste basket sales have increased dramatically due to improved appearance (see photograph). Actual production costs have been decreased, allowing GSW to offer the new, improved basket without a price increase.

GSW's Robert Stewart explains: "The waste baskets, which are intended for office use, now look much brighter than before, and we're very pleased with the new line. There were minor design changes to facilitate using prefinished steel and to improve the appearance of the baskets. For example, the sides are formed from a single sheet and lock seamed at the bottom. We have been impressed with Stelcolour steel's performance when undergoing all the forming to which it is subjected for this product."

The steel substrate used for the basket sides is cold rolled commercial quality, 0.024 inches (0.6 mm) thick by 22 and 44.5 inches (0.6 m and 1.1 m) wide. For the base, drawing quality cold rolled steel substrate is used, 0.18 inch (4.6 mm) thick by 23.5 inches (0.6 m) wide. The Stelcolour finish comprises an alkyd base with ink plus cure overcoat.

GSW introduced minor design changes to facilitate using prefinished steel for office waste baskets. Consequently, their appearance has improved and sales have increased dramatically.

Spacemaker's Storette Utility Shed is another example of the possibilities of roll formed, hot dip galvanized Stelcolour steel components. The shed is the latest of a long line of Spacemaker products.

Company: Spacemaker Products Limited

Product: Storette Utility Shed

Reasons for using Stelcolour steel: To facilitate fast, economical production, and at the same time provide the consumer with a durable, good quality product.

Details: In 1975 Spacemaker Products Limited of Mississauga, Ontario, added the Storette Utility Shed to the company's line of outdoor improvement products.

The Storette was designed to provide an attractive means of storing small or unsightly back yard items such as garbage bins, tires, barbeques and garden tools. And to do so utilizing as small an area as possible. Spacemaker believes this has been achieved in the 4 feet wide by 3 feet high by 2 feet deep (1.2 x 0.9 x 0.6 m) Storette Utility Shed.

Manufactured from Stelcolour prefinished steel, hot-dip galvanized (for extra protection) prior to the final paint coats, the Storette is a complementary product to Spacemaker's line of prefinished steel garden sheds. The available colours are brown for the walls and white for the doors. The doors are a significant feature in the Storette's design. The front doors slide, and the roof-door opens upward. Opening upward instead of sliding gives access to the entire roof area, and thereby facilitates the storage of large or irregular objects.

The Storette sheds are sold through leading retail and building supply outlets across Canada, in do-it-yourself assembly kits. The roll formed components are joined with fasteners in the same manner as the company's full-size garden sheds. It is Spacemaker's opinion that the Storette represents the best value for money in the marketplace in terms of quality and 'usability'. Certainly, consumer reaction has been very favourable.

stelco

The Steel Company of Canada, Limited
Hamilton, Ontario

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Cover: A photograph by Walter Riss depicting the AISI Award-winning ski equipment carrier designed by Leslie MacLeod of McMaster University, Hamilton, Ontario, set against an idyllic alpine backdrop.

Photography: Walter Riss, pages 2, 5, 8 and 10
Tom Bochsler, pages 6 and 7
Ken Orr, page 9
Jack Marshall, page 11

Drawings: Technical Publication Services, pages 3 and 4 (from original sketches by Leslie K. MacLeod).

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