ISO 9000: ISSUES FOR THE STRUCTURAL COMPOSITE LUMBER INDUSTRY

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ABSTRACT

The expanding global economy and formation of large international trading blocks have combined to drive worldwide acceptance of ISO 9000, the international standard dealing with quality system requirements that can be used for external quality assurance purposes. Although obtaining registration under ISO 9000 has become a market requirement in many industries, it is not yet so in the wood products industry, and more specifically for manufacturers of structural composite lumber (SCL). Manufacturers of SCL have increased their market share through a strategy that differentiates their products and services from commodity solid-sawn lumber. These strategies include the marketing of products with brand names, providing design services and installation guidelines, and providing after-sales support. ISO 9000 consists of three quality assurance standards. ISO 9003 only applies to companies that provide final inspection and testing services. ISO 9002 includes quality components for production, servicing, and installation. Several North American commodity wood products manufacturers are already registered to this standard. ISO 9001 includes product design and development. Maintaining differentiation from commodity lumber products would require that SCL companies seek registration under ISO 9001. This paper addresses the implications for SCL companies in obtaining registration to one of the three standards in the ISO 9000 series and discusses the advantages, limitations, and costs of such a strategic endeavor.

The expanding global economy and the need to overcome entrance and acceptance barriers in international markets have combined to drive worldwide acceptance of ISO 9000, the quality system and assurance compliance standard of the International Organization for Standardization (ISO). Although ISO 9000 has been hailed as a “de facto market requirement” (11), many firms and industries have yet to recognize a need to seek ISO 9000 registration. This is true of the wood products industry in the United States, and more specifically of the structural composite lumber (SCL) industry. As of May 1995, no U.S. or Canadian manufacturer has become registered (15). Firms in the specialized SCL industry are focused on meeting the demand of expanding domestic markets and only recently are looking to markets in Europe, the Pacific Rim, Australia, and elsewhere. However, there appear to be several reasons why SCL firms should be interested in adopting the ISO 9000 quality system requirements. The competitive advantages that ISO 9000 registration offers, through cost reduction and as an assurance of a company’s capability to supply quality services and products, are as relevant to the SCL industry as to other industries where ISO 9000 registration is widespread and rapidly expanding.

SCL is a generic term used to describe a set of engineered structural wood products that are designed for maximum strength and stiffness and efficient use of the wood resource. This set includes laminated veneer lumber (LVL), parallel strand lumber (PSL), and laminated strand lumber (LSL), the newest of these products (10). First produced in the United States in the early 1970s, production of LVL (and more recently of PSL and LSL) has increased because it replaces increasingly scarce high quality solid-sawn structural lumber (20).

This paper discusses the issues involved for manufacturers/distributors of SCL in obtaining registration to one of the three ISO 9000 series standards. A general discussion of the ISO 9000 quality system standards is followed by an overview of the basic market forces in the wood products industry. These two topics are then synthesized by describing the opportunities that exist for firms involved in the design, manufac-

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ture, marketing, and distribution of SCL, including recommendations with regard to ISO 9000 requirements.

**Overview of the ISO 9000 Series**

ISO published the first edition of the ISO 9000 quality system standards in 1987 and issued the first set of revisions in 1994. This series contains five documents that provide quality management guidelines as well as quality system requirements for quality assurance of products and services. As of October 1996, more than 90 countries had adopted the ISO 9000 series as national quality standards (15). The national equivalent of this series in the United States is the American National Standards Institute/American Society for Quality Control (ANSI/ASQC) Q9000-1994 series (8). A major reason why these standards have become so widely accepted is their flexibility — the series can be applied to both large and small manufacturing and service firms.

The ISO 9000 series standards are designed to provide guidance in two areas: quality management (ISO 9000 and ISO 9004) and quality assurance (conformance) (ISO 9001, ISO 9002, and ISO 9003). Companies do not obtain registration to the ISO 9000/9004 quality management portion of the series. Rather, they use the quality management standards to assist in development of a quality system so registration to ISO 9001, ISO 9002, and/or ISO 9003 can be obtained.

The conformance standards are models used for external quality assurance, each an independent document that can be selected as an appropriate match for the quality system needs of a company.

**ISO 9001**

ISO 9001: Quality systems — Model for quality assurance in design, development, production, installation, and servicing. This standard is the most comprehensive of the three conformance standards and includes all elements of ISO 9002 and ISO 9003. It is used primarily when the manufacturer or supplier must ensure product or service conformance throughout the entire product design and servicing cycle.

**ISO 9002**

ISO 9002: Quality systems — Model for quality assurance in production, installation, and servicing. The main difference between this standard and ISO 9001 is that ISO 9002 does not include the product design and development function. This standard applies to companies that provide products manufactured to established specifications.

**ISO 9003**

ISO 9003: Quality systems — Model for quality assurance in final inspection and test. This is the least comprehensive of the three conformance standards and only addresses requirements for detection and control of problems during final inspection and testing. This standard applies only to companies that provide final inspection and testing services and represents only about 5 percent of all registered companies in the United States.

**Overview of the Wood Products Industry**

**Traditional Wood Products**

Structural wood product construction markets in the United States are dominated by commodity products. As a comparison, softwood lumber production in the United States was approximately 31 billion board feet (BF) (73.2 million m$^3$) in 1993 (19), and North American production of LVL (the largest component of the SCL product group) in the same year was estimated to be 340 million BF (800,000 m$^3$) (12). Structural dimension lumber and structural panel products (plywood, oriented strandboard, and particleboard) designed for use in light-frame construction are widely distributed and available at do-it-yourself home centers, full-service lumberyards, and wholesale suppliers. With few exceptions, there is no differentiation in the form of brand naming or trademarks between similar products from different manufacturers. Typically, the primary marking of dimension lumber is a grade stamp. Structural panels have stamps with similar information and include the name of the manufacturer. However, consumers of commodity wood products generally purchase on the basis of price, as noted by buyers of wooden shakes (7), as opposed to other factors. Perhaps only in the market for treated-wood products does name recognition exist. However, recognition is for the chemical that is used to treat the wood for either preservative or fire-retardant characteristics, as opposed to the wood product itself. For example, Dricon (Hickson Corp., Conley, Ga.) is a widely recognized fire-retardant treatment and provides name recognition as well as a perceived level of performance for any wood product that is treated with Dricon.

**SCL Products**

During the past 25 years, reductions in the amount of large timber logs available for production of large-sized dimension lumber have increased the need for alternatives that offer a more stable supply and continued availability. This need led to the creation and evolution of SCL products. These value-added products have made sizable market gains in the wood construction industry. The increased uniformity (strength, stiffness, and dimension), flexibility (design and use), possible price stability as a result of the ready supply of small-diameter logs (18), and environmental acceptability of these products is expected to continue to erode the market domination of traditional wood products (4). Production of SCL to meet demand is expected to increase dramatically. APA—The Engineered Wood Association estimated an increase of 48 percent for LVL from 1993 to 1997 (1) and a consulting firm forecasted that LVL production by the year 2002 will be more than 3.5 times the 275 million BF (650,000 m$^3$) produced in 1992 (12). The majority of these increases, however, will be to satisfy domestic demand, supported by the fact that the only other major producer of SCL in the world, Finland, continues to export LVL into North America (18). However, a U.S. Department of Commerce report suggests that exports of value-added wood products to Japan will increase due to a 1990 United States/Japan agreement on wood products trade (9).

By 1992, six companies were producing LVL in the United States (18). Currently, a single company provides the only commercially available forms of PSL and LSL. These companies have gone to great lengths (compared with commodity lumber manufacturers and suppliers) to differentiate their products from those of other SCL suppliers and to emphasize the difference between commodity wood products and value-added SCL. Market gains made by SCL have come for the most part at the expense of traditional lumber products, rather than other construction materials.
like steel and concrete. Market strategies of SCL manufacturing and marketing companies include the following: product lines have brand names; companies specialize in design services (both product and building system) for certain product types and sizes; some companies provide inspection services after installation; and training in the proper design, use, and installation of products is often included with supplier/dealer relationships.

Concerning cost, 9.5-inch-deep by 1.75-inch-thick (24- by 4.5-cm) LVL was recently priced three times as much as Spruce-Pine-Fir (SPF) No. 2 & Btr. 2 by 10s (4.5 by 23.5 cm) in a lumberyard in Madison, Wis. The premium price paid by consumers is presumably justified by a number of factors. Among them is increased design flexibility, made possible with the strength characteristics of these value-added products. The allowable bending stress of LVL is approximately three times that of SPF; allowable shear parallel to grain of LVL is approximately four times that of SPF; and the modulus of elasticity of LVL is about 1.4 times greater than that of SPF dimension lumber.

As Vlosky et al. (18) point out, SCL appears to be “poised to move into the growth stage” of the product life cycle (PLC). The PLC (Fig. 1), which describes the stages anew product or technology goes through in the marketplace, has been established as a framework to guide strategic marketing decisions for industries and individual firms (5,13). Because competition increases and more versions of products are available, the primary marketing strategy suggested in the growth stage is to stress differentiation (3).

Efforts of product and market differentiation by SCL companies that provide value-added products and services not offered by traditional wood product companies can be complemented by ISO 9000 registration. The value-added label that accompanies SCL can be institutionalized with adoption of the ISO 9000 quality system requirements and provide an important means of differentiating SCL from commodity wood products in the marketplace.

**Issues of ISO Registration**

**Maintaining SCL Differentiation**

One important issue to address when implementing an ISO 9000 quality system is aligning the quality needs of the company and its customers with the company’s overall strategic business plan. Because ISO 9000 registration is not yet a market requirement of the wood products industry (for either maintaining market share or gaining entrance), it remains unclear if and/or when ISO 9000 should strategically be sought by SCL manufacturing companies. However, ISO 9000 registration, when utilized as an integral part of an overall quality program, can improve production consistency, reduce costs, and increase quality, and can be exploited as a product/service characteristic that enhances a company’s competitive position in the construction marketplace. Such registration could also heighten the distinction between commodity lumber and value-added SCL that SCL companies have fought to establish and maintain.

Manufacturers of commodity wood products only have a responsibility to ensure that their products meet the minimum requirements of the respective and relevant grading standards and satisfy installation and servicing requirements recommended by the manufacturer (required of ISO 9002). Firms that do not provide on-site servicing and installation services merely have to state so in the scope of the ISO 9002 registration.) Responsibility for design of the building system lies with other professionals, namely architects and engineers. Indeed, as of May 1996, 14 in each of the United States and Canada had already achieved ISO 9001, 9002, or 9003 registration in the lumber and wood products category (Standard Industrial Classification (SIC) 2400)(15). However, none of the 6 of these 28 that registered to ISO 9001 manufacture structural lumber or “lumber-like” (i.e. SCL) products. Producers of lumber products are registered to either ISO 9002 or 9003, and other commodity structural wood products producers will likely follow the lead of these companies and seek registration under ISO 9002. (Note that only eight North American SIC 2400 companies were ISO 9000 registered in May 1995, none of which were ISO 9001.)

To maintain the distinction between commodity wood products and SCL, it is desirable for SCL manufacturing companies to become registered to the most comprehensive standard, ISO 9001. The main difference between this standard and ISO 9002 and ISO 9003 is in the product design and development requirement of ISO 9001. Registration at the ISO 9001 level, compared with commodity suppliers registered to ISO 9002 or ISO 9003, could reinforce the fact that real differences exist between SCL and commodity wood products, specifically in the value-added products and services provided by those SCL companies. However, registration to ISO 9001 would not ensure that SCL firms could exploit it as an advantage. Educating consumers about the differences between the various standards of the ISO 9000 series and that those diff-
This product engineering, which provides for more efficient use of wood fibers than can be obtained with commodity lumber products, is why SCL is considered a subset of the larger group referred to as engineered wood products.
level of resources available for supporting the implementation process.

The three major costs associated with achieving ISO 9000 registration are:

1. Registrar. This external cost includes the third-party registrar’s fees covering documentation reviews, compliance and surveillance audits, and associated travel expenses. These costs total around $10,000 for a small company (less than 40 people) and $25,000 to $30,000 for companies with several hundred employees for the normal 3-year period of registration.

2. Consulting. This external cost includes the employee training and professional guidance typically needed for successful implementation, totaling $5,000 and up, depending on the level of in-house expertise and resources available.

3. Quality system development. This internal cost is attributable to the time that company personnel allocate to developing and implementing the quality system and related documentation. Although this cost is usually not an additional out-of-pocket cash flow, it is often 3 to 5 times the total of all external costs.

Various case studies have shown that the measurable benefits of ISO 9000 registration provide a payback period on external costs of approximately 4 to 6 months. Payback periods on total costs typically range from 2 to 3 years, regardless of the size of the company.

When obtaining registration for a company with several manufacturing plants, it is usually desirable to register each plant separately rather than as one group. When plants are registered separately, an unsatisfactory ISO 9000 audit at one plant will not affect operations at sister plants whose quality systems are operating satisfactorily.

**Conclusion**

Registering to one or more of the ISO 9000 quality system standards is becoming a market requirement for companies wishing to compete on a global scale. The SCL industry in the United States is focused on meeting increasing domestic demand and has only recently looked to international markets. These companies have specialized in providing product design and building design services that complement their products and differentiate themselves from traditional commodity wood products manufacturers.

The desire of SCL companies to maintain product differentiation and the nature of the products and services offered would require being registered to the ISO 9001 standard. Seeking ISO 9001 registration acknowledges and exploits the design and product development capabilities and product installation and on-site services offered by SCL companies. Consequently, registration to the most comprehensive quality standard, ISO 9001, appears to provide the maximum available advantage to SCL firms wishing to exploit the value-added nature of their products and services. The front-end costs associated with ISO 9000 registration can often be justified by the added operational benefits of lower costs, higher quality, and increased export sales. In conclusion, seeking ISO 9001 registration can be a strategic business decision for SCL companies desiring market growth, increased profitability, and an improved competitive position.

**Literature Cited**