# Hibernia Offshore Oil Platform
## St. John's, Newfoundland, Canada

**Structural:** Bridges & Marine

**Location:** St. John's, Newfoundland, Canada

**Contractor:** Kiewit with joint venture partner Norwegian Contractors

**Owner:** ExxonMobil Canada (33.125%), Chevron Canada Resources (26.875%), Petro-Canada (20%), Canada Hibernia Holding Corporation (8.5%), Murphy Oil (6.5%) and Norsk Hydro (5%).

The Hibernia Oil Field lies approximately 200 miles (315 km) east-southeast of St. John's, Newfoundland, Canada. When an offshore platform was deemed necessary to tap this rich petroleum resource, engineers and developers faced serious challenges. The project had to meet a tight construction schedule while overcoming the problems of working in extremely cold weather conditions. The structure had to withstand the most severe environmental stresses of freezing and thawing, ice abrasion, wind and wave action, and chemical attack. In addition, the giant structure was required to float, be towed to the site, and after placement withstand the impact of 5.5 million ton iceberg. To satisfy the tough requirements, a reinforced Gravity Base Structure (GBS) was designed. Weighing more than 1.2 million tons, the Hibernia offshore platform is the largest floating structure ever built in North America.

The base raft portion of the GBS was built in an earthen "dry dock." By flooding the dock, the base raft was floated, towed to a deep-water harbor area, anchored, and construction continued. Once completed, this floating giant was towed to the oil field site and set in place on the ocean floor in about 240 ft. (80m) of water. The GBS was designed to be maintenance free for its 30-year life.

The Hibernia Project represents the largest single use of high strength lightweight concrete in North America. An 11,600 psi (80 Mpa) cylinder strength concrete was produced by replacing approximately 50% by volume of the normal weight aggregate with high quality Stalite LWA. As a result, a high performance, a lighter weight concrete was achieved, with a density reduction of about 10%, and with mechanical properties comparable to its original normal density counterpart. Tests on compressive and tensile strength, modulus of elasticity, Poisson's ration, stress/strain behavior, permeability, and freeze/thaw resistance proved that the unique toughness of the Stalite LWA was a significant factor in achieving the high strength and durability specified in the design.

At peak production the Hibernia Project required concrete to be poured around the clock, at a rate of 1430 yd3/day (1100 m3/day) for up to sixty consecutive days. Such a production schedule calls for maximum aggregate consistency. Hibernia held to a rigorous materials quality assurance program. Continuous testing was performed on the aggregate, fresh concrete and hardened concrete. The uniformity of *STALITE*'s gradation, absorption and the specific gravity was confirmed day in and day out. The low absorption characteristics of *STALITE* LWA were a decisive factor in the materials selection process for the Hibernia Offshore Platform. The low absorption of *STALITE* LWA provided assurance of both construction consistency and freeze/thaw durability. This project required a concrete that consistently met the severe constructability demands of massive, continuous, long-distance pumping, congested steel, and slip forming construction. The low absorption of *STALITE* LWA facilitated the maintenance of stable moisture levels in the aggregate for easy pumping and placement of high workability, high slump concrete with no segregation and excellent cohesiveness. In addition, the low absorption of the aggregate combined with entrained air minimized the risk of concrete damage by freeze and thaw action.

To satisfy the requirements of constructability, concrete production and placement, and durability, a 10,000 psi (69 Mpa) normal density concrete was originally specified for this project. Among other characteristics, this concrete was to consistently have the following: high strength, high modulus of elasticity, high tensile strength, high freeze and thaw resistance, high workability and slump with no segregation, low permeability, and high pumpability.

To improve the buoyancy of the GBS, it was later determined that a reduction of about 10% in concrete density would be advantageous. The weight reduction had to be achieved without affecting the strength, durability and constructability spelled out in the original design. To achieve these objectives, approximately 50% (by volume) of the normal density coarse aggregate needed to be replaced with a lightweight aggregate of the highest possible quality.

The concrete for this project required characteristics of durability, high performance and reduced density. After a careful evaluation of lightweight aggregates available worldwide, Carolina Stalite Company was selected as the sole supplier of the structural lightweight aggregate (LWA) for this project. Using our participation in the Hibernia project as an example, *STALITE* understand customer needs and construction requirements, delivers the required product and service, and contributes to the success of small and large infrastructure projects worldwide. We hope to be of service to you on your next project because we take pride in your success.

***Built with***

STALITE
STRUCTURAL
LIGHTWEIGHT AGGREGATE