Continuous Casting of Steel Billets, Blooms and Slabs

Course

BRIMACOMBE
CONTINUOUS CASTING
COURSE

April 24 to April 28, 2017

Pinnacle Vancouver Harbourfront Hotel
1133 West Hastings Street, Vancouver, B.C. Canada V6E 3T3

Sponsored by the Brimacombe Continuous Casting Society

www.brimacombecourse.org

Dr. J. Keith Brimacombe
**WHO WILL BENEFIT**

The Brimacombe Continuous Casting Course is designed for people who are concerned with controlling and improving the quality and production rate of continuously cast steel shapes. Persons who will benefit include shop floor operating personnel, quality control and research personnel, management personnel and individuals in support industries associated with continuous casting.

**COURSE DESCRIPTION**

Topics to be covered include chemical interactions, steel cleanliness, transfer operations, fluid flow, tundish metallurgy, mould design/behaviour, spray systems, heat extraction, solidification, segregation, electromagnetic stirring, crack formation and newer technologies such as thin slab casting. The Course offers a practical understanding of the continuous-casting process and quality based on fundamental principles, and deals with problems commonly experienced in production. Much of what will be presented and discussed is based on our research, some of it unpublished, which spans a twenty-five year time period.

**CORRESPONDENCE AND INFORMATION**

The Brimacombe Continuous Casting Society
Mary Jansepar, Course Coordinator
Materials Engineering
The University of British Columbia
Room 309 - 6350 Stores Road
Vancouver, B.C. Canada V6T 1Z4

Telephone: (604) 822-2676 (Mary Jansepar)
Facsimile: (604) 822-3619
Email: info@brimacombecourse.org
Website: www.brimacombecourse.org

**COURSE CO-DIRECTORS:**
Dr. Edward S. Szekeres
Dr. Indira V. Samarasekera

**The Brimacombe Continuous Casting Society is a Canadian non-profit organization.**
# Course Lecture Schedule

## Brimacombe Continuous Casting Course 2017

**Pinnacle Vancouver Harbourfront Hotel**  
1133 West Hastings Street  
Vancouver, B.C. Canada  V6E 3T3

### Sunday, April 23rd
- **5:30 - 8:00 p.m.**  
  COCKTAIL RECEPTION (with light buffet)  
  Pinnacle Vancouver Harbourfront Hotel  
  Ballroom Foyer, 2nd Floor

### Monday, April 24th
- **7:00 - 7:30 a.m.**  
  Continental Breakfast and Registration  
  Confirmation, Ballroom Foyer
- **7:30 - 8:00 a.m.**  
  Welcome to Course (ESS)
- **8:00 - 8:30 a.m.**  
  Tribute to Keith Brimacombe (IVS)
- **8:30 - 8:45 a.m.**  
  BREAK
- **8:45 - 9:15 a.m.**  
  Brief Introduction to Continuous Casting Systems (ESS)
- **9:15 - 10:15 a.m.**  
  Considerations in Caster Operation (RJO)
- **10:15 - 11:00 a.m.**  
  Inclusion Defects (RJO)
- **11:00 - 12:00 p.m.**  
  Chemistry Control (RJO)
- **12:00 - 1:15 p.m.**  
  LUNCH BREAK
- **1:15 - 2:00 p.m.**  
  Slags for Ladle and Tundish (RJO)
- **2:00 - 2:45 p.m.**  
  Slag-Metal Interface Phenomena (RJO)
- **2:45 - 3:00 p.m.**  
  BREAK
- **3:00 - 4:00 p.m.**  
  Cleanliness Control (RJO)
- **5:00 p.m.**  
  Bus depart for cruise (Pinnacle Vancouver Harbourfront Hotel)
- **6:00 - 9:00 p.m.**  
  HARBOUR CRUISE WITH COCKTAILS AND DINNER (SPOUSES INCLUDED)

### Tuesday, April 25th
- **7:00 - 7:30 a.m.**  
  Continental Breakfast, Ballroom Foyer
- **7:30 - 10:00 a.m.**  
  Caster Operation to Minimize Oxide Defects (RJO)
- **10:00 - 10:15 a.m.**  
  BREAK
- **10:15 - 12:00 p.m.**  
  Basic Aspects of Moulds (BGT)
- **12:00 - 1:15 p.m.**  
  LUNCH BREAK
- **1:15 - 2:30 p.m.**  
  Aspects of Mould Oscillation (ESS)
- **2:30 - 3:30 p.m.**  
  Mould Powders (RJO)
- **3:30 - 3:45 p.m.**  
  BREAK
- **3:45 - 5:30 p.m.**  
  Fluid Flow in the Mould (BGT)

### Wednesday, April 26th
- **7:00 - 7:30 a.m.**  
  Continental Breakfast, Ballroom Foyer
- **7:30 - 9:45 a.m.**  
  Strand Solidification on a Macroscale – Empirical Methods (ESS)
- **9:45 - 10:00 a.m.**  
  BREAK
- **10:00 - 11:00 a.m.**  
  Solidification on a Microscale (ESS)
- **11:00 - 12:00 p.m.**  
  Solidification-Related Imperfections (ESS)
- **12:00 - 1:15 p.m.**  
  LUNCH BREAK
- **1:15 - 2:30 p.m.**  
  Mould Heat Transfer (BGT)
- **2:30 - 3:15 p.m.**  
  Below-Mould Heat Transfer (BGT)
- **3:15 - 3:30 p.m.**  
  BREAK
- **3:30 - 4:30 p.m.**  
  Grade Transitions (BGT)
- **4:30 - 5:30 p.m.**  
  High Temperature Mechanical Properties of Steel (BGT)

### Thursday, April 27th
- **7:00 - 8:00 a.m.**  
  Canadian Breakfast in the Vistas 360 (19th Floor)
- **8:00 - 9:30 a.m.**  
  Crack Formation (IVS)
- **9:30 - 9:40 a.m.**  
  Presentation of Course Certificates
- **9:40 - 10:00 a.m.**  
  BREAK (Divide Lecture Room)
- **10:00 - 11:00 a.m.**  
  I Billet Mould Design, Operation, and Maintenance (IVS)  
  II Nozzle Design and Flow Issues in Slab Casting (BGT)
- **11:00 - 12:00 p.m.**  
  Billet Mould Tapers, Oil Lubrication and Billet Quality (IVS)  
  Slab Mould Behaviour (BGT)
- **12:00 - 1:15 p.m.**  
  LUNCH BREAK
- **1:15 - 3:00 p.m.**  
  I Upsets in Billet Casting (IVS)  
  II Slab Mould Tapers (BGT)
- **3:00 - 3:15 p.m.**  
  BREAK
- **3:15 - 4:15 p.m.**  
  I Defects in Billet Casting – Wrap up (IVS)  
  II Online Detection of Breakouts and Slab Quality Problems (BGT)
- **4:15 - 5:30 p.m.**  
  I Panel Discussion on Billet Casting (IVS/ESS)  
  II Panel Discussions on Slabs/Bloom Casting (RJO/BGT)

### Friday, April 28th
- **7:00 - 7:30 a.m.**  
  Continental Breakfast, Ballroom Foyer
- **7:30 - 8:45 a.m.**  
  Spray Cooling and Related Defects (IVS)
- **8:45 - 9:00 a.m.**  
  BREAK
- **9:00 - 10:00 a.m.**  
  Casting Defects and Product Performance Case Study (BGT & RJO)
- **10:00 - 11:30 a.m.**  
  Containment in the Submould Region (ESS)
- **11:30 - 12:00 p.m.**  
  Challenges in High Speed Casting (BGT)
- **12:00 p.m.**  
  COURSE ENDS

**NOTE:** Audio and/or video taping of lectures is not permitted.

*Groups divided into billets and slabs/blooms for simultaneous sessions.*
GENERAL INFORMATION
The Course will be held at the Pinnacle Vancouver Harbourfront Hotel in downtown Vancouver. The hotel is located at 1133 West Hastings Street, Vancouver, B.C. Canada V6E 3T3. A limited block of rooms has been reserved for course attendees at a reduced rate. This special rate only applies to room reservations made on or before March 23, 2017, so MAKE YOUR RESERVATION EARLY! Room reservations can most easily be made via links on our website <www.brimacombecourse.org>. The website also includes a phone number for the hotel. However, to obtain the special rate when making reservations by phone you must STATE THAT YOU ARE ATTENDING THE BRIMACOMBE CONTINUOUS CASTING COURSE. The most convenient means of transportation between the Vancouver International Airport and the Pinnacle Vancouver Harbourfront Hotel is by taxi (about $35). An alternative means is via the Canada Line SkyTrain at a cost of $8.75. The exit station is within 3 blocks of the Pinnacle Vancouver Harbourfront Hotel. You can buy tickets from the ticket vending machines located at the Canada Line Station in the airport. An informative guide to Vancouver travel and other attractions can be found at: http://www.vancouver-travel-tips.com. Many excellent restaurants are located within easy walking distance of the hotel. Western business casual is typical dress for the Course. U.S. CITIZENS: PLEASE NOTE THAT YOU MUST POSSESS A VALID U.S. PASSPORT FOR CUSTOMS.

INSTRUCTORS
Dr. Indira V. Samarasekera: Distinguished Fellow, Liu Institute for Global Issues, University of British Columbia. Member of the National Academy of Engineering. Previously President and Vice-Chancellor, University of Alberta and Vice President Research, University of British Columbia. Expert in heat flow and stress analysis with extensive experience in mould design and its effect on quality.

Dr. Brian G. Thomas: Professor of Mechanical Engineering, Colorado School of Mines at Golden, CO. Over 30 years experience conducting research on the continuous casting of steel. Expert in computational modeling.

Dr. Edward S. Szekeres: Principal Consultant, Casting Consultants, Inc. His experience includes over twenty years at U.S. Steel Research plus over 30 years as an independent consultant on continuous casting. Expert on solidification and caster design.

Dr. Ronald J. O’Malley: Professor and also Director of the Kent D. Peaslee Steelmaking Manufacturing Research Center, Missouri University of Science & Technology. Previous positions: Researcher, Armco Inc.’s Technology Center, chief metallurgist at Nucor Steel–Decatur LLC. AIST Distinguished Member and Fellow. Expertise in clean steel and thin-slab continuous casting technologies.

REGISTRATION
Registration is easily made on our website or by completing the form below and sending it in either by FAX or EMAIL. When you register for the course, both an information letter and an invoice will be emailed to you. For registration to be complete, the full fee must be sent to the address given below by March 23, 2017. Payment can be either by cheque (preferred) or by wire transfer. Upon payment, a confirmation number will be issued and the registration process is complete. A confirmation number is required for admittance. If the fee is not prepaid, the application will be cancelled on March 24. Registration after March 23 is subject to space availability and must be accompanied by the fee. A cancellation charge of 20% of the fee will be levied for withdrawal of a registration after March 23.

THE BRIMACOMBE CONTINUOUS CASTING SOCIETY
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Registration Form

I enclose _______ to cover the fee for the Continuous Casting of Steel Billets, Blooms and Slabs, April 24-28, 2017

$2,750 Canadian or $2,850 US

CHEQUE TO BE MADE PAYABLE TO THE BRIMACOMBE CONTINUOUS CASTING SOCIETY

First Name _______________________ Middle Initial _________________ Surname ____________________________________________

Position or Title ________________________________________________________________

Company ____________________________________________ Plant ____________________________

Address ____________________________________________________________________________

Telephone No. _______________________  Facsimile  ___________________________  Email ____________________________

MAIL REGISTRATION FORM AND CHEQUE TO:
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NO CREDIT CARD PAYMENTS ACCEPTED. FEE(S) MUST BE RECEIVED BY MARCH 23, 2017. PERSONAL CHEQUES ACCEPTED.

Bank Information (for wire transfers only)
The Royal Bank of Canada
4501 West 10th Avenue
Vancouver, B.C. Canada V6R 2J2

Brimacombe Continuous Casting Society
Account Number: 07600-1016344
SWIFT CODE: ROYCCAT2

Purpose of funds: Brimacombe Continuous Casting Course fee(s) & invoice number