```
// Filename: LCD_CL2_3.h
// Updated 04-11-2017
// --- LCD Display Functions for CL2-R.OLIVA 2009
// Adapted from indoor.c & Other..
// 6.02.2009
// Hardware supposed for CL2bm1:
// * PC.4-PC.7 LCDDATA
// * PD.7 LCD_E
// * PC.3 LCD_RW
// * PC.2 LCD_RS

// vCL2 - 9 for CVAVR 2.045 21.1.2010
// Group definitions, correct #endif
// define MAX_COL to 16
// VCL2bm1 - ATMega644P - Convert to LCD 4x20
// Rename with underscores LCD_CL2_3.h for portability
// Version 28.1.2017 - Add Extended LDC1_INCL_H guards (previous LDC1_INCL only half the file(??))
// Rev 4.11.2017 after KIERAS Rule compliance analysis in:
// C:\cvavr328\Work3\CL2\CL2_Drivers\LCD\LCD4x20(2010)\DOC
//      \LCD_4x20(2010)_TESTING FOR HEADER RULES COMPLIANCE(1stIteration)_v04-11-2017.docx
// Rule #5 & #6 violations: Local functions and variables should be kept visible only to .c file,
// not exposed in .h, and defined as static.


#ifndef LCD_DRIVER_H

#define LCD_DRIVER_H

// 28-01-2017 Include necessary definitions..
#include <mega1284p.h>
#include <delay.h>

// #define   20 since 3.5.2010
#define MAX_LCD_COL 20

#define LCD_E       PORTD.7     /* LCD Control Lines */
#define LCD_RS      PORTC.2     // Different from INDOOR.C!!! 14.3.2006
#define LCD_RW      PORTC.3

// Bit structure typedef for LCD - access on upper PortC 6.2.09
// In O'Cull book, p63, bit_x undefined ->compiler complains!
typedef struct {
   unsigned int bit_0:1;
   unsigned int bit_1:1;
   unsigned int bit_2:1;
   unsigned int bit_3:1;
   unsigned int bit_4:1;
   unsigned int bit_5:1;
   unsigned int bit_6:1;
   unsigned int bit_7:1;
} bits;

// LCD Port defines
#define LCD_DB0 PORTC.4
#define LCD_DB1 PORTC.5
#define LCD_DB2 PORTC.6
#define LCD_DB3 PORTC.7


// ***********************************************************
// No Externaly accessible variables here..
// ***********************************************************



// ***********************************************************
// LCD Function Definitions - same as lcd1.c/.h in Mega128DEV2a
```

```
// 4.11.2017 - Local functions wr_half, wr_disp, line() declaration
// moved to start of .c file:

void init_display(void);
void clear_display(void);
void set_LCD_cur(char LCDrow, char LCDcol);
void disp_char(unsigned char c);
void disp_str(unsigned char *sa);                    // display string from RAM
void disp_cstr(unsigned char flash *sa);          // display string from ROM


#endif
```