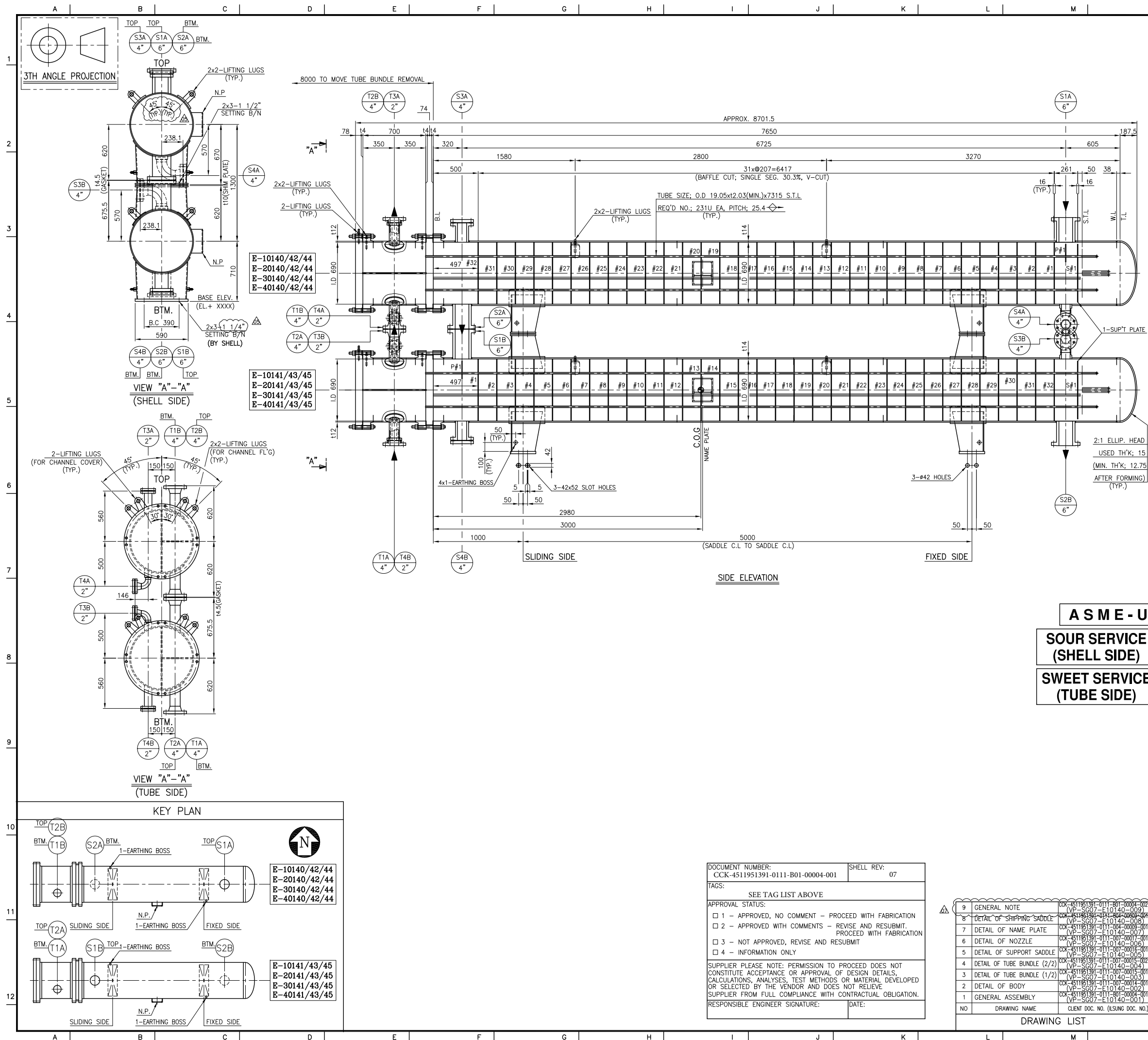




| DESIGN DATA                                                                   |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
|-------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------|------------------|------------------------|----------|
| CODE                                                                          |           | ASME SEC. VIII DIV. 1 2010 ED.+ 2011 ADD.<br>+ API 660 (8th ED. 2007) + NACE MR0175 / ISO 15156 |         |                                                                                                                                                                                                                                                                                   |       | TEMA CLASS                        |                  | "R" (9TH ED.-'07)      |          |
|                                                                               |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       | TYPE                              |                  | H-AEU                  |          |
| SURFACE AREA PER UNIT/SHELL(EFF.)                                             |           | 199.2/199.2 m <sup>2</sup>                                                                      |         |                                                                                                                                                                                                                                                                                   |       | CODE STAMP/NB REQ'D               |                  | ASME (U)/YES           |          |
|                                                                               |           | 24 (TWENTY FOUR)                                                                                |         |                                                                                                                                                                                                                                                                                   |       | LOCAL REGULATION                  |                  | ABSA                   |          |
|                                                                               |           | SHELL SIDE                                                                                      |         |                                                                                                                                                                                                                                                                                   |       | TUBE SIDE                         |                  |                        |          |
| KIND OF FLUID                                                                 |           | TREATED BITUMEN                                                                                 |         |                                                                                                                                                                                                                                                                                   |       | PRIMARY DILUENT                   |                  |                        |          |
| SPECIAL SERVICE                                                               |           | SOUR                                                                                            |         |                                                                                                                                                                                                                                                                                   |       | SWEET                             |                  |                        |          |
| PROCESS DESIGN PRESS.(INT./EXT.)                                              |           | 2450/F.V                                                                                        |         | kPa(g)                                                                                                                                                                                                                                                                            |       | 2450/F.V                          |                  | kPa(g)                 |          |
| DESIGN TEMP. (INT./EXT.)                                                      |           | 200                                                                                             |         | °C                                                                                                                                                                                                                                                                                |       | 200                               |                  | °C                     |          |
| OPER. PRESS.                                                                  |           | 1295                                                                                            |         | kPa(abs)                                                                                                                                                                                                                                                                          |       | 1436                              |                  | kPa(abs)               |          |
| OPER. TEMP. (IN/OUT)                                                          |           | 130/39.3                                                                                        |         | °C                                                                                                                                                                                                                                                                                |       | 0.631/122                         |                  | °C                     |          |
| HYDRO. TEST PRESS.                                                            |           | SHOP                                                                                            |         | 4011 kPa(g)                                                                                                                                                                                                                                                                       |       | 3656                              |                  | kPa(g)                 |          |
|                                                                               |           | FIELD                                                                                           |         | 3658 kPa(g)                                                                                                                                                                                                                                                                       |       | 3342                              |                  | kPa(g)                 |          |
| PNEUM. TEST PRESS.                                                            |           | -                                                                                               |         | kPa(g)                                                                                                                                                                                                                                                                            |       | -                                 |                  | kPa(g)                 |          |
| M.A.W.P / M.A.P                                                               |           | 2814/3095                                                                                       |         | kPa(g)                                                                                                                                                                                                                                                                            |       | 2571/2822                         |                  | kPa(g)                 |          |
| GOVERNED COMPONENT(M.A.W.P/M.A.P)                                             |           | TUBESHEET/SHELL FLANGE                                                                          |         |                                                                                                                                                                                                                                                                                   |       | CHANNEL COVER/CHANNEL COVER FL'G  |                  |                        |          |
| M.D.M.T. AT M.A.W.P/M.A.E.P                                                   |           | -45 °C AT 2814/F.V kPa(g)                                                                       |         |                                                                                                                                                                                                                                                                                   |       | -45 °C AT 2571/F.V kPa(g)         |                  |                        |          |
| P.W.H.T.                                                                      |           | YES                                                                                             |         |                                                                                                                                                                                                                                                                                   |       | YES                               |                  |                        |          |
| S.R.OF HEAD AFTER COLD FORMING                                                |           | YES (NORMALIZING)                                                                               |         |                                                                                                                                                                                                                                                                                   |       | -                                 |                  |                        |          |
| IMPACT TEST                                                                   |           | NO (SEE NOTE 3)                                                                                 |         |                                                                                                                                                                                                                                                                                   |       | NO (SEE NOTE 3)                   |                  |                        |          |
| RADIOGRAPH (S/H)                                                              |           | 100%/100%                                                                                       |         |                                                                                                                                                                                                                                                                                   |       | 100%/ -                           |                  |                        |          |
| JOINT EFFICIENCY (S/H)                                                        |           | 1.0/1.0                                                                                         |         |                                                                                                                                                                                                                                                                                   |       | 1.0/-                             |                  |                        |          |
| CORR. ALLOW. (mm)                                                             |           | 1.5(SHELL) / 3(NOZLES)                                                                          |         |                                                                                                                                                                                                                                                                                   |       | 0.8(TUBES)/1.5(CHANNEL)/3(NOZLES) |                  |                        |          |
| NO. OF PASS                                                                   |           | 1 (ONE)                                                                                         |         |                                                                                                                                                                                                                                                                                   |       | 4 (FOUR)                          |                  |                        |          |
| INSULATION (BY OTHERS)                                                        |           | 75                                                                                              |         | mm                                                                                                                                                                                                                                                                                |       | 75                                |                  | mm                     |          |
| FIREPROOFING                                                                  |           | -                                                                                               |         |                                                                                                                                                                                                                                                                                   |       | mm                                |                  |                        |          |
| WIND VELOCITY                                                                 |           | NBC CANDA 2005                                                                                  |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| SEISMIC ZONE                                                                  |           | NBC CANDA 2005                                                                                  |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| PAINTING                                                                      |           | AS PER DEP 30.48.00.31-GEN.                                                                     |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| WEIGHT (UPPER/ LOWER)                                                         |           | ERECTION                                                                                        |         | 7325/7500 [14825] kg                                                                                                                                                                                                                                                              |       | BUNDLE                            |                  | 3810 kg                |          |
|                                                                               |           | EMPTY                                                                                           |         | 8015/8190 [16205] kg                                                                                                                                                                                                                                                              |       | FULL OF WATER                     |                  | 10810/10985 [21795] kg |          |
| [TOTAL]                                                                       |           | OPERATING                                                                                       |         | 10810/10985 [21795] kg                                                                                                                                                                                                                                                            |       |                                   |                  |                        |          |
| TUBE & TUBESHEET JOINT HEAVY EXPANDING WITH TWO GROOVES - 4-6% WALL REDUCTION |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| NOZZLE SCHDULE                                                                |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| MARK NO.                                                                      | NO. REQ'D | PIPE                                                                                            |         | FLANGE                                                                                                                                                                                                                                                                            |       |                                   | FROM C/L TO FACE | DESCRIPTION            | REMARK   |
|                                                                               |           | SIZE                                                                                            | SCH.    | RATING                                                                                                                                                                                                                                                                            | TYPE  | FACING                            |                  |                        |          |
| S1A                                                                           | 1         | 6"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | 620              | SHELL SIDE INLET       |          |
| S1B                                                                           | 1         | 6"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | 675.5            | SHELL SIDE INLET       |          |
| S2A/B                                                                         | 2         | 6"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | 620              | SHELL SIDE OUTLET      |          |
| S3A                                                                           | 1         | 4"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | 560              | SHELL SIDE VENT        | W/B.F    |
| S3B                                                                           | 1         | 4"                                                                                              | 80      | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | SHELL SIDE VENT        | W/B.F    |
| S4A                                                                           | 1         | 4"                                                                                              | 80      | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | SHELL SIDE DRAIN       | W/B.F    |
| S4B                                                                           | 1         | 4"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | 560              | SHELL SIDE DRAIN       | W/B.F    |
| T1A/B                                                                         | 2         | 4"                                                                                              | 120     | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | TUBE SIDE INLET        |          |
| T2A/B                                                                         | 2         | 4"                                                                                              | 120     | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | TUBE SIDE OUTLET       |          |
| T3A                                                                           | 1         | 2"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | SEE DWG.         | TUBE SIDE VENT         | W/B.F    |
| T3B                                                                           | 1         | 2"                                                                                              | 160     | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | TUBE SIDE VENT         | W/B.F    |
| T4A                                                                           | 1         | 2"                                                                                              | 160     | ASME 300#                                                                                                                                                                                                                                                                         | W.N   | R.F                               | SEE DWG.         | TUBE SIDE DRAIN        | W/B.F    |
| T4B                                                                           | 1         | 2"                                                                                              | -       | ASME 300#                                                                                                                                                                                                                                                                         | L.W.N | R.F                               | SEE DWG.         | TUBE SIDE DRAIN        | W/B.F    |
| ITEM NO.                                                                      |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| 1                                                                             | E-10140   | 13                                                                                              | E-30140 | Document Number: CCK-4511951391-0111-B01-00004-001                                                                                                                                                                                                                                |       |                                   |                  | Rev: 07                |          |
| 2                                                                             | E-10141   | 14                                                                                              | E-30141 | Approval Status:                                                                                                                                                                                                                                                                  |       |                                   |                  |                        |          |
| 3                                                                             | E-10142   | 15                                                                                              | E-30142 | <input checked="" type="checkbox"/> 1 - Approved, No Comment - Proceed with Fabrication/Construction                                                                                                                                                                              |       |                                   |                  |                        |          |
| 4                                                                             | E-10143   | 16                                                                                              | E-30143 | <input type="checkbox"/> 2 - Approved, Note Comments - Revise and Resubmit. Proceed with Fabrication/Construction                                                                                                                                                                 |       |                                   |                  |                        |          |
| 5                                                                             | E-10144   | 17                                                                                              | E-30144 | <input type="checkbox"/> 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction                                                                                                                                                                     |       |                                   |                  |                        |          |
| 6                                                                             | E-10145   | 18                                                                                              | E-30145 | <input type="checkbox"/> 4 - Information Only                                                                                                                                                                                                                                     |       |                                   |                  |                        |          |
| 7                                                                             | E-20140   | 19                                                                                              | E-40140 | WARNING PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test results or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations. |       |                                   |                  |                        |          |
| 8                                                                             | E-20141   | 20                                                                                              | E-40141 | Responsible Engineer Signature: Wayne Gossett (Wayne.Gossett@shell.com)                                                                                                                                                                                                           |       |                                   |                  |                        |          |
| 9                                                                             | E-20142   | 21                                                                                              | E-40142 | Date: 01/22/2015                                                                                                                                                                                                                                                                  |       |                                   |                  |                        |          |
| 10                                                                            | E-20143   | 22                                                                                              | E-40143 |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| 11                                                                            | E-20144   | 23                                                                                              | E-40144 |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
| 12                                                                            | E-20145   | 24                                                                                              | E-40145 |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
|                                                                               |           |                                                                                                 |         |                                                                                                                                                                                                                                                                                   |       |                                   |                  |                        |          |
|                                                                               |           | 2014.12.23                                                                                      |         | ISSUED FOR APPROVAL                                                                                                                                                                                                                                                               |       |                                   |                  | TY-ENG                 | H.S.JEON |
|                                                                               |           | 2014.11.17                                                                                      |         | ISSUED FOR APPROVAL                                                                                                                                                                                                                                                               |       |                                   |                  | TY-ENG                 | H.S.JEON |
|                                                                               |           | 2014.08.13                                                                                      |         | ISSUED FOR APPROVAL                                                                                                                                                                                                                                                               |       |                                   |                  | TY-ENG                 | W.I.LEE  |
|                                                                               |           | 2014.07.10                                                                                      |         | ISSUED FOR APPROVAL                                                                                                                                                                                                                                                               |       |                                   |                  | TY-ENG                 | W.I.LEE  |
|                                                                               |           | 2014.07.02                                                                                      |         | ISSUED FOR APPROVAL                                                                                                                                                                                                                                                               |       |                                   |                  | TY-ENG                 | W.I.LE   |