I. Call to Order
II. Approve Agenda
III. Consent Agenda
   1. Minutes pgs 4-7
      May 14, 2019 regular meeting minutes.
   2. Bills and Claims for Payment pgs 8-20
      Bills and Claims for Payment for the month ending May 31, 2019.
   3. Communications
      A. Hires:
         Amber L. Embert:
         Associate Instructor, Dental Hygiene Program; effective August 13, 2019; with salary
         at the annual rate of $70,243.
      B. Resignations:
         Mary A. Jones:
         Custodian; effective June 28, 2019.
      C. Terminations:
         Daniel R. Kemnitz:
         Electrical Technology Program Co-Coordinator, Industrial Trainer, and Adjunct
         Instructor; effective May 31, 2019.
   4. Secretary Reports
      Financial Reports: pgs 21-42
      Attached are the reports for the General, Auxiliary, Plant, Agency, Scholarship, and Loan
      Funds for the month ending May 31, 2019.
IV. President’s Reports
   1. Approve Plans and Specs for the College Safety Project: pgs 43-236
      Approval of the College Safety Project proposed plans, specifications, and form of
      contract: A public hearing on the proposed plans, specifications, and form of contract
      is scheduled for 5:00 pm. Attached are the plans, specifications, form of contract and
      estimated cost, which will require Board approval once the hearing is closed.
   2. Approve Updates to Board Policies: pgs. 237-252
      The Board will be asked to approve updates to Board Policy 224, 303, 305, 308, 501,
      502, 503, 504, 506, and 508. Information is attached.
3. Approve Transfer Majors: pgs. 253-260
   The Board will be asked to approve the following Transfer Majors. Information is attached.
   A. Biology Transfer Major AA
   B. Biology Transfer Major AS
   C. Criminal Justice Transfer Major AA
   D. Psychology Transfer Major AA

4. The Board will be asked to approve curriculum changes to the following. Information is attached. pgs. 261-285
   A. Engineering and Design Tech Program
   B. Liberal Arts Curriculum Changes
   C. Business Department Curriculum Changes
   D. Industrial Technology Department Curriculum Changes
   E. Introduction to Organic and Biochemistry CHM-132
   F. Introductory Biology BIO-105
   G. Business Computing CSC-116

5. Last Dollar Scholar Curriculum Approval:
   A. Criminal Justice
   B. Medical Assistant

6. 2019-2020 Updated Employee Handbook:
   Attached

7. 2nd Chance Pell Update.

8. IACCT Annual Conference July 24-26 at IWCC.

9. Possible Closed Session on Litigation:
   A closed session may be necessary to discuss litigation.

10. Possible Closed Session on Negotiations Strategy:
    A closed session may be necessary to discuss negotiations strategy.

11. Possible Closed Session on Personnel:
    A closed session may be necessary to discuss personnel.

12. Possible Closed Session on Real Estate:
    A closed session may be necessary to discuss real estate.

V. Board Communication
1. Events, Notes, Etc. pgs. 286-287

VI. Unfinished Business
VII. New Business

VIII. Adjournment

The next regular meeting of the Board is scheduled for Tuesday July 9, 2019

Iowa Central Community College provides quality educational opportunities in and outside the classroom. For all we serve, Iowa Central Community College strives to be the premier learning community, and college of choice, preparing the best citizens and workers for our region and beyond.
The Board of Directors of Merged Area (Education) V Community College District (IOWA CENTRAL
COMMUNITY COLLEGE) met in regular session at 5:00 p.m., Tuesday, May 14th, 2019, in the
Warren Hunt Conference Center of the Triton Café, One Triton Circle, Fort Dodge, Webster
County, Iowa.

I. Call to Order

The meeting was called to order by the President of the Board.

The following members were found to be present: Tom Chelesvig, Mark Crimmins, Darrell
Determann, Larry Hecht, Terri Wessels, Doug McDermott, Bennett O’Connor, Connie Smith.
Absent: Deb Loerch

Also present for the meeting were President, Dr. Dan Kinney; Vice Presidents, Tom Beneke, Dr.
Stacy Mentzer, Jim Kersten, and Angie Martin, Mary Ludwig; and Secretary, Ally Walter.

II. Recognition of Groups

A. Michelle Ramthun and Focus International
B. CLIC and LINC participants-Shawna Schuler and Collette Bertran
C. Dr. Humburg and VITA

Recognized.

III. Approve Agenda

Moved by Darrell Determann and seconded by Connie Smith to approve, with two additions to
Communications. Motion carried unanimously.

IV. Approve Consent Agenda:

1. Minutes
   A. April 9, 2019, regular meeting and April 25, 2019 Special Meeting
2. Bills and claims for payment
   A. For the month ending April 30, 2019
3. Communications

A. Hires:
   1. Cynthia L. Simpson:
      STEMM Division Secretary; effective May 28, 2019; with salary at the
      annual rate of $24,856.00
   2. Elizabeth K. Peterson:
      Career Navigator and ESL Support Specialist; effective May 1, 2019; with
      salary at the annual rate of $37,323.00.
   3. Jeanine M. Tucker:
      Distance Learning Assistant Coordinator; effective April 15, 2019; with
      salary at the annual rate of $33,793.00.
   4. Naomi M. England:
      Academic Assistance Specialist and Men’s and Women’s Sports Shooting
      Coach; effective April 8, 2019; with salary at the annual rate of
      $30,327.00.

A. Resignations:
   1. Virginia M. Culp:
      Online Enrollment Representative; effective May 10, 2019.
   2. Zachariah J. Spencer:
      Associate Instructor, Welding Technology Program; effective May 10,
      2019.

4. Secretary

A. Financial Reports:
   For the General, Auxiliary, Plant, Agency, Scholarship, and Loan funds for the
   month ending April 30, 202019.

Moved by Larry Hecht and seconded by Tom Chelesvig to approve, with two additions to communications. Motion carried unanimously.

V. President

1. Agreement with the Iowa Central Community College Classified Employees
   Association:
   The Board will need to consider a proposed agreement for the Iowa Central
   Community College Classified Employees Association. Information is attached.

Moved by Terri Wessels and seconded by Bennett O’Connor to approve. Motion carried unanimously.

2. Administrative Salaries and Benefits for 2019-2020:
Salaries and benefits will be proposed for the Administrative staff. Information will be available at the meeting.

Moved by Larry Hecht and seconded by Terri Wessels to approve. Motion carried unanimously.

3. President’s Wages for 2019-2020:
The Board will be asked to approve the President’s wages for 2019-2020. Information will be available at the meeting.

Moved by Darrell Determann and seconded by Tom Chelesvig to approve. Motion carried unanimously.

4. Paying Agent Assignment:
The Board will be asked to authorize the appointment of UMB (formerly Bankers Trust Company) to serve as Trustee, Escrow Agent and/or Paying Agent for certain outstanding certificates, bonds, and notes; and approve and authorize the execution of a Paying Agent, Registrar, and Transfer Agent agreement with UMB (formerly Bankers Trust Company) with respect to said certificates, bonds, and notes. Information is attached.

Moved by Larry Hecht and seconded by Doug McDermott to approve. Motion carried unanimously.

5. Update of Depository Resolution:
The Board will need to adopt the resolution naming depositories for Iowa Central Community College funds. Information is attached.

Moved by Larry Hecht and seconded by Connie Smith to approve. Motion carried unanimously.

6. Curriculum Diploma Approval:
The Board will be asked to approve the Swift App Development Diploma. Information is attached.

Moved by Terri Wessels and seconded by Larry Hecht to approve. Motion carried unanimously.

7. GO Bond Update:
Updated

8. Legislative Update:
Updated
9. IACCT Update: Updated.

10. Possible Closed Session on Negotiations Strategy: A closed session may be necessary to discuss negotiations strategy. Not needed.

11. Possible Closed Session on Personnel: A closed session may be necessary to discuss personnel. Not needed.

12. Possible Closed Session on Litigation: A closed session may be necessary to discuss litigation. Not needed.

13. Possible Closed Session on Real Estate: A closed session may be necessary to discuss real estate. Not needed.

VI. Board Communication
   A. Events, notes, etc. Presented.

VII. Unfinished Business None.

VIII. New Business None.

IX. Adjournment
    Moved by Terri Wessels and seconded by Connie Smith to approve. Motion carried unanimously.

Next Meeting
The next regular meeting of the Board is scheduled Tuesday, June 11, 2019, at 5:00 p.m.

Allyson Walter
Secretary

ATTEST:

Mark R. Crimmins
President
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**GRAND TOTAL** $6,815,191.26

______________________________  ______________________________
Allyson Walter                  Dr. Dan Kinney
Board Secretary                President
# Iowa Central Community College

**Financial Report for the Period Ended May 31, 2019**

## General Ledger Classification

<table>
<thead>
<tr>
<th>Description</th>
<th>General Fund</th>
<th>General Restricted Fund</th>
<th>Auxiliary Fund</th>
<th>Agency Fund</th>
<th>Scholarship Fund</th>
<th>Loan Fund</th>
<th>Plant Fund</th>
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<td>(903,506.17)</td>
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## Liabilities & Fund Balance

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<th>General Fund</th>
<th>General Restricted Fund</th>
<th>Auxiliary Fund</th>
<th>Agency Fund</th>
<th>Scholarship Fund</th>
<th>Loan Fund</th>
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<td>142,167,028.68</td>
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**Secretary's Balance + Outstanding Checks = Treasurer's Balance**

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<th>Secretary's Balance + Outstanding Checks</th>
<th>Treasurer's Balance</th>
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<td>53,651,794.38</td>
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## Iowa Central Community College

**Financial Report for the Period Ended May 31, 2018**

### General Ledger Classification

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<th>Assets</th>
<th>General Fund</th>
<th>General Restricted Fund</th>
<th>Auxiliary Fund</th>
<th>Agency Fund</th>
<th>Scholarship Fund</th>
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### Liabilities & Fund Balance

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<th>General Restricted Fund</th>
<th>Auxiliary Fund</th>
<th>Agency Fund</th>
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<th>Loan Fund</th>
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### Secretary's Balance + Outstanding Checks = Treasurer's Balance

| Secretary's Balance + Outstanding Checks = Treasurer's Balance | 28,370,421.86 | 207,186.96 | 28,572,408.82 |

---

Allison Walter
Secretary
Board of Directors

Return to Agenda
# Iowa Central Community College Revenue

**Year To Date Fiscal Year 2018 - 2019**

**May 2019**

## Fund: 1 Unrestricted General Fund

<table>
<thead>
<tr>
<th>Object ID and Name</th>
<th>Art-Sci</th>
<th>Voc-Tech</th>
<th>Cont Ed</th>
<th>260E</th>
<th>Admin</th>
<th>Student Services</th>
<th>Learning Resources</th>
<th>Physical Facilities</th>
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### Iowa Central Community College Revenue

**Year To Date Fiscal Year 2017 - 2018**

**May 2018**

**Fund: 1 Unrestricted General Fund**

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## Iowa Central Community College Revenue

Year To Date Fiscal Year 2018 - 2019
May 2019

Fund: 2 Restricted General Fund

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## Iowa Central Community College Revenue
**Year To Date Fiscal Year 2017 - 2018**
**May 2018**

**Fund: 2 Restricted General Fund**

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## Iowa Central Community College Revenue

**Year To Date Fiscal Year 2018 - 2019**  
**May 2019**

**Fund: 7 Plant Fund**

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## Iowa Central Community College Revenue

**Year To Date Fiscal Year 2017 - 2018**

### May 2018

**Fund: 7 Plant Fund**

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# Iowa Central Community College
## Expenditures
### Year To Date Fiscal Year 2018 - 2019
#### May 2019

**Fund: 1 Unrestricted General Fund**

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<td>(62,143)</td>
<td>(103,455)</td>
<td>(489,264)</td>
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| Group Total                        | 5,481,733| 5,691,503| 1,053,652| 0            | 888,300| 4,789,926        | 77,335              | 2,137,412             | 2,382,624| 22,502,485 |

| 601 Professional Services          | 345,790  | 66,004   | 206,171  | 0            | 183,304| 124,515          | 0                   | 0                   | 395,096   | 398,530     | 1,719,410 |
| 602 Election Costs                 | 0        | 0        | 0        | 0            | 0     | 0                | 0                   | 0                   | 0        | 0          | 2,714     |
| 604 Membership Dues                | 2,966    | 16,663   | 995      | 0            | 108,461| 8,555            | 242                 | 405                 | 37,193    | 175,479     |
| 605 Legal Publications             | 0        | 0        | 0        | 0            | 0     | 0                | 0                   | 0                   | 0        | 2,532      |
| 606 Equipment Maintenance & Repair | 0        | 17,271   | 49,480   | 0            | 0     | 190              | 0                   | 67,668              | 455       | 135,065     |
| 609 Building Maintenance & Repair  | 0        | 0        | 36       | 0            | 0     | 0                | 0                   | 8,000               | 0         | 8,036       |
| 610 Maintenance Of Grounds         | 0        | 0        | 0        | 0            | 0     | 0                | 0                   | 0                   | 0         | 0          |
## Iowa Central Community College
### Expenditures

**Year To Date Fiscal Year 2018 - 2019**  
**May 2019**

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<th>2018 Q4</th>
<th>2019 Q2</th>
<th>2018 Q3</th>
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<th>2019 Q2</th>
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# Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018**

May 2018

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<td>587 SDI - Employer Share</td>
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<td>589 Taxable Tip Expense</td>
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<td>590 Fringe Benefits (Ins.)</td>
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<td>605 Legal Publications</td>
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### Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018
May 2018**

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<th>Category</th>
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<th>YTD 2016</th>
<th>Change</th>
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Report Name: F001EXP

Return to Agenda
## Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018**

**May 2018**

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## Iowa Central Community College

### Expenditures

**Year To Date Fiscal Year 2018 - 2019**

**May 2019**

**Fund: 2 Restricted General Fund**

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<th>Admin</th>
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<th>Learning Resources</th>
<th>Physical Facilities</th>
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**Group Total**

|                | 0       | 294,557  | 965,959 | 132,206| 273,558| 0                  | 0                  | 0                   | 4,285,479| 5,951,759|

| 601 Professional Services               | 0       | 28,000   | 96      | 75,250| 18,249| 0                | 0                  | 0                   | 1,162,311| 1,308,395|
| 604 Membership Dues                     | 0       | 0        | 0       | 0    | 1,900 | 0                | 0                  | 0                   | 3,250    | 22,460|
| 606 Equipment Maintenance & Repair      | 0       | 902      | 1,360   | 0    | 0     | 0                | 0                  | 0                   | 0        | 2,262|
| 609 Building Maintenance & Repair       | 0       | 0        | 0       | 0    | 0     | 0                | 0                  | 0                   | 0        | 0     |
| 610 Maintenance Of Grounds              | 0       | 0        | 0       | 0    | 0     | 0                | 0                  | 0                   | 0        | 0     |
| 611 Information Services                | 0       | 0        | 30,236  | 0    | 0     | 0                | 0                  | 0                   | 30,236   | 30,236|
| 612 Printing & Reproduction Svcs.       | 0       | 0        | 6,550   | 846  | 147   | 0                | 0                  | 0                   | 414      | 7,957 |
| 615 Communications                      | 0       | 0        | 577     | 0    | 0     | 0                | 0                  | 0                   | 0        | 577   |
| 618 Insurance                           | 0       | 0        | 0       | 0    | 0     | 0                | 0                  | 0                   | 475,936  | 590,288 |
| 621 Rental Of Buildings                 | 0       | 0        | 15,309  | 0    | 0     | 0                | 0                  | 0                   | 15,309   | 15,309|
| 622 Rental Of Equipment                 | 0       | 0        | 0       | 0    | 0     | 0                | 0                  | 0                   | 0        | 0     |
| 623 Postage                             | 0       | 0        | 0       | 0    | 0     | 0                | 0                  | 0                   | 4        | 4     |
| 624 Group Meeting/workshop Expense      | 0       | 2,846    | 23,891  | 0    | 1,170 | 0                | 0                  | 0                   | 0        | 78    |
| 626 Other Contractual Services          | 0       | 0        | 360,003 | 0    | 0     | 0                | 0                  | 0                   | 25,000   | 385,003|

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Return to Agenda
Iowa Central Community College
Expenditures

Year To Date Fiscal Year 2018 - 2019
May 2019

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# Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018**

**May 2018**

**Fund: 2 Restricted General Fund**

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38 **Return to Agenda**
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#### May 2018

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### Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018**

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# Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2018 - 2019**  
**May 2019**

**Fund: 7 Plant Fund**

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# Iowa Central Community College Expenditures

**Year To Date Fiscal Year 2017 - 2018**

**May 2018**

**Fund: 7 Plant Fund**

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CAMPUS SAFETY PROJECT
IOWA CENTRAL COMMUNITY COLLEGE
ONE TRITON CIRCLE, FORT DODGE, IA 50501

DATE: 6/6/2019
PROJECT NO: 2019-069

TECHNOLOGY

ARCHITECTURAL

PROFESSIONAL SEAL

SCHEDULE OF DRAWINGS

GENERAL
G0.1 MAIN CAMPUS MAP
G0.2 REMOTE CAMPUS MAPS
G1.1 GENERAL NOTES
G2.1 TECHNOLOGY DETAILS
G3.1 SCHEDULES
G3.2 SCHEDULES
G3.3 SCHEDULES
G3.4 SCHEDULES
G3.5 SCHEDULES
G3.6 SCHEDULES
G3.7 SCHEDULES
G3.8 SCHEDULES
G3.9 SCHEDULES
G3.10 SCHEDULES
G3.11 SCHEDULES
G4.1 SYMBOLS

FORT DODGE MAIN CAMPUS
E0.0 FORT DODGE SITE PLAN
AE1.1 AST-APPLIED SCIENCE & TECH
AE1.2 AST-APPLIED SCIENCE & TECH
AE1.1 BHS-BIOSCIENCE & HEALTH BLDG
AE1.1 CEB-CAREER EDUCATION BLDG
AE1.2 CEB-CAREER EDUCATION BLDG
AE1.1 D9B-DORM 9B & DORMS 1-14
AE1.1 D15-DORM 15
AE1.1 LIB-LIBERAL ARTS
AE1.1 PHY-PHYSICAL FACILITIES BLDG
AE1.1 SAC-STUDENT ACTIVITY CENTER
AE1.2 SAC-STUDENT ACTIVITY CENTER
AE1.1 SBD-SCIENCE BUILDING
AE1.1 SRC-STUDENT RESOURCE CENTER
AE1.1 SSS-STUDENT SUPPORT SERVICES
AE1.2 SSS-STUDENT SUPPORT SERVICES
AE1.1 TRC-TRITON CAFE
AE1.1 WOR-WORKFORCE IOWA

FORT DODGE EAST CAMPUS & REMOTE CAMPUS
AE1.1 ITB-INDUSTRIAL TRAINING BLDG
AE1.1 OBQ-OFFICE BLDG QUAIL
AE1.1 CRM-CRIMMONS BLDG
AE1.2 CRM-CRIMMONS BLDG
AE1.1 TNS-TRANSPORTATION

EAGLE GROVE CAMPUS
AE1.1 EAG-ARMORY AND SOUTH BLDGS

STORM LAKE CAMPUS
AE1.1 MSC-MELVIN SAMUELSON CENTER

WEBSTER CITY CAMPUS
AE1.1 WSB-SCIENCE BUILDING
AE1.1 TCC-TOM CHELESVIG CENTER
AE1.1 WSS-STUDENT SUPPORT SERVICES
TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

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IOWA CENTRAL COMMUNITY COLLEGE - SECURITY

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G0.1 MAIN CAMPUS MAP
G0.2 REMOTE CAMPUS MAPS
G1.1 GENERAL NOTES
G2.1 TECHNOLOGY DETAILS
G3.1 SCHEDULES
G3.2 SCHEDULES
G3.3 SCHEDULES
G3.4 SCHEDULES
G4.1 SYMBOLS

FORT DODGE MAIN CAMPUS
AE1.1 AST-APPLIED SCIENCE & TECH
AE1.2 AST-APPLIED SCIENCE & TECH
AE1.1 BHS-BIO & HEALTH
AE1.1 CEB-CAREER ED BLDG
AE1.2 CEB-CAREER ED BLDG
AE1.1 LIB-LIBERAL ARTS
AE1.1 MNT-MAINTENANCE
AE1.1 SAC-STUDENT ACTIVITY CENTER
AE1.2 SAC-STUDENT ACTIVITY CENTER
AE1.1 SBD-SCIENCE BUILDING
AE1.1 SRC-STUDENT RESOURCE CENTER
AE1.1 SSS-STUDENT SUPPORT SERVICES
AE1.2 SSS-STUDENT SUPPORT SERVICES
AE1.1 TRC-TRITON CAFE
AE1.1 WOR-WORKFORCE IOWA

FORT DODGE EAST CAMPUS & REMOTE CAMPUS
AE1.1 IND-INDUSTRIAL TRAINING BUILDING
AE1.1 WET-WESTERN EXPRESS TERMINAL
AE1.1 CRI-CRIMMONS
AE1.1 TNS-TRANSPORTATION

EAGLE GROVE CAMPUS
AE1.1 EGL-ARMORY AND SOUTH BLDGS

STORM LAKE CAMPUS
AE1.1 MSC-MELVIN SAMUELSON CENTER

WEBSTER CITY CAMPUS
AE1.1 SCI-SCIENCE
AE1.1 TCC-TOM CHELESVIG CENTER
WSS-STUDENT SUPPORT

END OF SECTION 00 01 15
SECTION 00 52 00
AGREEMENT FORM

PART 1 GENERAL
1.01 FORM OF AGREEMENT
1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.
1.03 RELATED REQUIREMENTS
   A. Section 00 72 00 - General Conditions.

PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)

END OF AGREEMENT FORM 00 52 00
SECTION 00 72 00
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION 00 72 00
PART 1 GENERAL

1.01 PROJECT

A. Project Name: Iowa Central Community College - Safety Project.
B. Owner's Name: Iowa Central Community College.
   1. Owner's Representative: Dr. Dan Kinney, 1 Triton Cir, Fort Dodge, IA 50501.
C. Engineer's Name: Engineering Technologies, Inc.
   2. Engineer's Construction Manager: Bryan Rahn, 825 M Street, Suite 200, Lincoln, NE 68508. (402) 476-1273.
D. The Project consists of the installation of new S2 Security, Security Management System (SMS) and integrated Milestone Video Management System (VMS). Systems shall include new access control components, cabling, door hardware, cameras and associated cabling. Provide all programming, licensing and integration required for a complete and operational system. Systems shall be installed throughout all Iowa Central Community College Campuses.
E. Anticipated Contract Approval date: July 16, 2019.
F. Anticipated Start date: July 17, 2019.
G. Anticipated Completion date: December 31, 2019.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 50 00 - Contracting Forms and Supplements.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings and as specified.
B. Scope of alterations work is shown on drawings.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
B. Arrange use of site and premises to allow:
   1. Work by Others.
   2. Work by Owner.
   3. Use of site and premises by the public.
   4. Parking will be available on site in existing parking lot area.
C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.
D. Existing building spaces may be used for storage in areas approved by Owner.
E. Time Restrictions:
   1. Coordinate any time restrictions with the Owner’s requirements.
   2. Coordinate construction activities with owner's general contractor for major renovations.

END OF SECTION 01 10 00
SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Procedures for preparation and submittal of applications for progress payments.
   C. Change procedures.

1.02 SCHEDULE OF VALUES
   A. Form to be used: Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
   B. Forms filled out by hand will not be accepted.
   C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
   D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.
   E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
   F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS
   A. Payment Period: Submit at intervals stipulated in the Agreement.
   B. Form to be used: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
   C. Forms filled out by hand will not be accepted.
   D. For each item, provide a column for listing each of the following:
      1. Item Number.
      2. Description of work.
      4. Previous Applications.
      5. Work in Place and Stored Materials under this Application.
      6. Authorized Change Orders.
      7. Total Completed and Stored to Date of Application.
      8. Percentage of Completion.
      10. Retainage.
   E. Execute certification by signature of authorized officer.
   F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
   G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
   H. Submit three copies of each Application for Payment.
   I. Include the following with the application:
      1. Transmittal letter as specified for Submittals in Section 01 30 00.
      2. Construction progress schedule, revised and current as specified in Section 01 30 00.
   J. When Engineer requires substantiating information, submit data justifying dollar amounts in question.
1.04 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.

B. For minor changes not involving an adjustment to the Contract Price or Contract Time, Engineer will issue instructions directly to Contractor.

C. For other required changes, Engineer will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Price or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 days.

E. Contractor may propose a change by submitting a request for change to Engineer, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 60 00.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
   4. For change ordered by Engineer without a quotation from Contractor, the amount will be determined by Engineer based on the Contractor's substantiation of costs as specified for Time and Material work.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide following data:
      a. Quantities of products, labor, and equipment.
      b. Overhead and profit.
      1) Changes in the work shall be as established in the Contract Documents. the following fees will be used for lump sum pricing and actual cost pricing of additions and deletions to that Work included in the Bid, namely:
         a) To Subcontractor for work performed by their own forces: Not to exceed 10%.
         b) To Subcontractor for work performed by other then their own forces: Not to exceed 5%.
         c) To Subcontractor's Subcontractor/Material supplier for work performed by Subcontractor's Subcontractor/Material supplier own forces: Not to exceed 10%.
         d) To Subcontractor's Subcontractor/Material supplier for work performed by other than Subcontractor's Subcontractor/Material supplier own forces. Fee includes general requirements, all supervision, overhead and profit: Not to exceed 5%.
      d. Credit for deletions from Contract, similarly documented.
2. For authorized Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

H. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00
SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Preliminary schedule.

1.02 SUBMITTALS
A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE
A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT
A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
B. Identify each item by specification section number.
C. Identify work of separate floors and other logically grouped activities.
D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
E. Provide legend for symbols and abbreviations used.

3.03 REVIEW AND EVALUATION OF SCHEDULE
A. Participate in joint review and evaluation of schedule with Engineer at each submittal.
B. Evaluate project status to determine work behind schedule and work ahead of schedule.
C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.04 UPDATING SCHEDULE
A. Maintain schedules to record actual start and finish dates of completed activities.
B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
C. Annotate diagrams to graphically depict current status of Work.
D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
E. Indicate changes required to maintain Date of Substantial Completion.
F. Submit reports required to support recommended changes.

3.05 DISTRIBUTION OF SCHEDULE
A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.
B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION 01 32 16
SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS


1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
C. Design Data: Submit for Engineer’s knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner’s information.
D. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Engineer, provide interpretation of results.
   2. Test report submittals are for Engineer’s knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner’s information.
E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the
Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.03 TESTING AND INSPECTION AGENCIES
   A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
   B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
   C. Contractor Employed Agency:
      2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
      3. Laboratory: Authorized to operate in Nebraska.
      4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION
   A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
   B. Comply with manufacturers' instructions, including each step in sequence.
   C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
   D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
   E. Have Work performed by persons qualified to produce required and specified quality.
   F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
   G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION
   A. See individual specification sections for testing required.
   B. Testing Agency Duties:
      1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
      2. Perform specified sampling and testing of products in accordance with specified standards.
      3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
      4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
      5. Perform additional tests and inspections required by Engineer.
      6. Submit reports of all tests/inspections specified.
   C. Limits on Testing/Inspection Agency Authority:
      1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
      2. Agency may not approve or accept any portion of the Work.
      3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.

3.03 MANUFACTURERS' FIELD SERVICES
A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.04 DEFECT ASSESSMENT
A. Replace Work or portions of the Work not conforming to specified requirements.
B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION 01 40 00
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Temporary utilities.
B. Temporary sanitary facilities.
C. Temporary Controls: Barriers, enclosures, and fencing.
D. Security requirements.
E. Vehicular access and parking.
F. Waste removal facilities and services.

1.02 TEMPORARY UTILITIES
A. Owner will provide the following:
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.
B. Existing facilities may be used.
C. New permanent facilities may be used.

1.03 TEMPORARY SANITARY FACILITIES
A. Use of existing facilities is permitted.
B. New permanent facilities may be used during construction operations.
C. Maintain daily in clean and sanitary condition.

1.04 BARRIERS
A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
C. Provide protection for plants designated to remain. Replace damaged plants.
D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 SECURITY
A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
B. Coordinate with Owner's security program.

1.06 VEHICULAR ACCESS AND PARKING
A. Coordinate access and haul routes with governing authorities and Owner.
B. Provide and maintain access to fire hydrants, free of obstructions.
C. Provide means of removing mud from vehicle wheels before entering streets.
D. Designated existing on-site roads may be used for construction traffic.
E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
F. Existing parking areas may be used for construction parking.

1.07 WASTE REMOVAL
A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
B. Provide containers with lids. Remove trash from site daily.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00
SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Re-use of existing products.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations and procedures.
E. Procedures for Owner-supplied products.
F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS
A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS
A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS
A. Provide new products unless specifically required or permitted by the Contract Documents.

2.03 PRODUCT OPTIONS
A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named prior to bid.

2.04 MAINTENANCE MATERIALS
A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.
PART 3  EXECUTION

3.01  SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. The Engineer will notify Contractor in writing of decision to accept or reject request.

3.02  OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03  TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00
SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
C. Pre-installation meetings.
D. Cutting and patching.
E. Surveying for laying out the work.
F. Cleaning and protection.
G. Starting of systems and equipment.
H. Demonstration and instruction of Owner personnel.
I. Closeout procedures, except payment procedures.
J. General requirements for maintenance service.

1.02 SUBMITTALS
A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.
C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   5. Work of Owner or separate Contractor.

1.03 QUALIFICATIONS
A. For demolition work, employ a firm specializing in the type of work required.
B. For survey work, employ a land surveyor registered in Nebraska and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 PROJECT CONDITIONS
A. Use of explosives is not permitted.
B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Coordinate conduct of especially noisy work with Owner.
E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION
A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
B. Notify affected utility companies and comply with their requirements.
C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
F. Coordinate completion and clean-up of work of separate sections.
G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS
2.01 PATCHING MATERIALS
A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
C. Examine and verify specific conditions described in individual specification sections.
D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION
A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS
A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
B. Require attendance of parties directly affecting, or affected by, work of the specific section.
C. Notify Engineer four days in advance of meeting date.
D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK
A. Verify locations of survey control points prior to starting work.
B. Promptly notify Engineer of any discrepancies discovered.
C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
D. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
F. Utilize recognized engineering survey practices.
G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
H. Periodically verify layouts by same means.
I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS
A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS
A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Engineer before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.
B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

D. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

H. Restore work with new products in accordance with requirements of Contract Documents.

I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

K. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

L. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

M. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

N. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP
A. Coordinate schedule for start-up of various equipment and systems.
B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
D. Verify that wiring and support components for equipment are complete and tested.
E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION
A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.12 ADJUSTING
A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING
A. Use cleaning materials that are nonhazardous.
B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
E. Clean filters of operating equipment.
F. Clean site; sweep paved areas, rake clean landscaped surfaces.
G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES
A. Make submittals that are required by governing or other authorities.
B. Notify Engineer when work is considered ready for Substantial Completion.
C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer’s review.
D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
E. Notify Engineer when work is considered finally complete.
F. Complete items of work determined by Engineer’s final inspection.

3.15 MAINTENANCE
A. Provide service and maintenance of components indicated in specification sections.
B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00
PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.
B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
I. Return: To give back reusable items or unused products to vendors for credit.
J. Reuse: To reuse a construction waste material in some manner on the project site.
K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS
A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards.
      c. Include weight tickets as evidence of quantity.
   7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION
2.01 WASTE MANAGEMENT PROCEDURES
A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Engineer.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19
SECTION 26 01 01
ELECTRICAL WORK

PART 1 GENERAL

1.01 SCOPE

A. This Section shall apply to all Contractors and Subcontractors that are responsible for Division 26, 27, and 28.

B. The work covered by this Section of the Specifications consists of furnishing all labor and materials (unless otherwise specified) and in performing all operations necessary for the installation of the complete electronic and electrical system as required by terms and conditions of the Contract. The work shall also include the completion of such details of electrical work not mentioned or shown which are necessary for the successful operation of all electrical and electronic systems described on the drawings or required by these Specifications.

C. The work in this Contract involves the installation of new work as well as work on the Site and may include demolition and renovation work. It shall be this Contractor's responsibility to visit the site so that he may ascertain all existing conditions which may affect the work under his Contract. No additional compensation will be granted for additional work required by this Contractor for his failure to visit the jobsite and determine existing conditions. This Contractor shall provide all labor and materials required to complete the work described in the Plans and Specifications and as may be required for a ready to operate installation.

D. Generally the removal and repairing of existing floors, walls, ceilings, etc., in the remodeled areas where required for the installation of conduit, lights, panels, etc., shall be provided by the General Contractor under the direction of this Contractor. Holes required through floors, walls, and roof of the building shall be provided by this Contractor. If specifically shown to be done by this Contractor, this Contractor shall include in his Contract price the removal and replacement of general construction materials as required.

1.02 DEFINITIONS

A. Where the terms "provide" or "shall be" are used in the Specifications or Plans, they shall be taken to mean, "the Electrical Contractor shall furnish and install".

B. Where the word "electrical" is used in these Specifications and Plans it shall mean both "electrical and electronic" as the case may be.

C. The term "Contractor" used throughout Division 26, 27, and 28 of these Specifications shall be understood to mean the Electrical Contractor.

D. The term "as shown on the drawings" has been omitted from this Specification, but it shall be understood that the drawings and Specifications compliment one another and items specified shall also meet the criteria set forth on the drawings.

1.03 DRAWINGS

A. The drawings which constitute a part of this Contract indicate the general arrangement of circuits and outlets, locations of switches, panelboards, and other work. The Drawings and Specifications are complimentary each to the other, and what is called for by one shall be binding as if called for by both. Data presented on these drawings are as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required. Review all Architectural, Structural, and Mechanical Plans and adjust all work to conform to all conditions shown therein. The Architectural Drawings shall take precedence over all other drawings as to dimensions.

1.04 CONFLICTS

A. Any conflict noted between (1) the Drawings; (2) Specifications; or (3) Drawings and Specifications; or (4) between Plans and Codes or Ordinances or (5) between the Plans or Specifications and Manufacturer's installation recommendations shall be immediately brought to the attention of the Architect for clarification. If conflicts are discovered prior to bidding and there is not sufficient time to obtain a clarification from the Architect prior to bidding, the
Contractor shall bid the larger quantity or better quality of work. All conflicts shall be brought to the attention of the Architect when discovered and before installation.

B. Contractor shall be responsible to field measure and confirm mounting heights and locations of electrical equipment with respect to counters, radiation, etc. Do not scale distances off the Electrical Plans. Use actual building dimensions from the Architectural Drawings.

1.05 WORK IN EXISTING BUILDINGS

A. All work in existing buildings, indicated on the drawings or specified herein, shall be executed with a minimum amount of interference with the normal activities of the occupants of the building. No services or utilities shall be interrupted without previous scheduling time of the same with the Owner and receipt of his approval. Changing of the electrical system, telephone system, and other major events shall be arranged and be agreeable with the Owner to length and time of downtime. All work shall be scheduled in advance with the Owner and shall not proceed without the Owner's written approval.

B. The Owner shall be notified before starting to weld or cut. Fire extinguishers shall be immediately accessible when welding or cutting with an open flame or arc. Welding or cutting with an open flame or arc must be stopped in a timely fashion before leaving premises.

C. Noisy operations such as those involving use of air hammers, etc., in demolition, or cutting of openings shall be scheduled with the Owner.

D. Typically, the Owner will continue to occupy the building and carry on normal activity. Each Contractor shall protect the occupied areas from dust, smoke, etc., by a method approved by the Owner/Architect.

1.06 EXAMINATION OF SITE

A. Prior to submitting a bid, this Contractor shall visit the site of the job and ascertain all conditions affecting the proposed electrical installation and make provisions as to the cost thereof. No additional compensation will be granted for additional work required by this Contractor for failure to visit jobsite and determine existing conditions. The Contractor shall verify location and size of existing systems that are to be connected to, routed around, or extended from.

B. The Contractor shall verify with the City and Utility Companies, and Owner, etc., the location of any existing overhead or buried utilities on or near the site. The Contractor shall verify requirements for connecting into existing utilities with the City and Utility Company, and Owner and connect into as required. Failure to determine existing conditions or the nature of new connections will not be considered a basis for the granting of additional compensation.

1.07 PRIOR APPROVAL

A. The Contractor's attention is directed to the requirement of "prior approval" for materials to be supplied in this project if they are not specifically designated as a specified manufacturer or approved equal.

B. Prior approval requires that literature be submitted to the Architect a minimum of ten (10) days prior to the bidding date. This submitted material shall be informative enough to allow the Engineer to give approval. This approval is a tentative approval and does not imply anything but approval to bid.

1.08 SHOP DRAWINGS

A. The Contractor shall submit Shop Drawings of all items of equipment listed in this Specification and on the Drawings. Shop Drawings shall be submitted whether they are the exact specified manufacturer's numbers or a different manufacturer and number.

B. Where an item or portion of the equipment differs from the Specifications, this fact shall be called to the attention of the Engineer to permit evaluation of the alternate item. Approval of the equipment will be only to the degree that the information is shown on the submittal and it shall not be construed to mean approval of items, materials, or details not shown but which are required by the Specification or Plans.

C. Shop Drawings will be reviewed to the extent of the information shown on the submittal. Review of an item of equipment cannot be construed to mean approval for components of that item of
equipment for which no information is furnished to show compliance with Plans and Specifications. Where additional work, controls, wiring, components, etc., are required to install and or make an operable system, or such controls, wiring components etc., are required by the Plans and Specifications, the approval of these drawings shall not relieve the Contractor from furnishing all items and the quantity required.

D. Shop Drawings shall indicate manufacturer's delivery time for the item after receipt of approval by the Engineer.

1.09 USE OF OTHER THAN SPECIFIED EQUIPMENT

A. All equipment shown on the drawing shall be specified equipment. If the Contractor uses different approved equipment than what was specified, all additional work or components required to make an operable system shall be made without additional cost to the Owner. The Contractor shall be held responsible for selecting different approved equipment so that equipment will fit into the available space provided for the specified equipment.

1.10 PERMITS AND LICENSES

A. Obtain and pay all permits and licenses required and furnish the Architect for the Owner a certificate of final inspection and approval from the Local Authority having jurisdiction over this electrical installation.

1.11 WARRANTY

A. The entire electrical system installed under this Contract shall be left in proper working order. Replace, without additional charge, any work or material (except materials not furnished by the Electrical Contractor) which develops defects from ordinary wear and tear within one (1) year from the date of acceptance, or provide extended warranty, as specified. All new material and equipment shall be warranted against defects in composition, design, or workmanship. Lamps shall be warranted for their published life. Warranty certificates shall be furnished on special equipment.

1.12 PROGRESS OF WORK AND DOWNTIME

A. Order the progress of the electrical work so as to conform to the progress of the work as scheduled in the Specifications and complete the entire installation as soon as the condition of the building will permit. Any cost resulting from defective or ill-timed work performed under this Section shall be borne by this Contractor.

B. As much of this building may be occupied when construction is ongoing it will be of prime importance to coordinate downtime of electrical systems with the Owner. Changing of the electrical entrance and other major events shall be arranged and be agreeable with the Owner to length and time of downtime.

1.13 COORDINATION

A. The Contractor shall confirm dimensions noted and locations of General and Mechanical Contractor's equipment as well as equipment to be furnished by the Owner. Verify all equipment and motor sizes, voltage and connection requirements for equipment furnished by others and wired under this Contract before roughing-in, and provide proper branch circuits and connections as recommended by equipment manufacturers. Coordinate with the other contractors to avoid interference with ductwork, structural members, grilles, cabinetwork, etc. Motors shall not be connected to until verification has been made that motor running protection exists.

B. Where the drawings indicate fixtures and equipment which are to be furnished by others (or Owner) and which require connections to the electrical systems, the Electrical Contractor shall furnish and install all rough-in of conduit, boxes, conductors, disconnect switches, plugs with pigtail, receptacles etc., which are required for the final connections. Rough-in locations and required connections shall be determined from the equipment itself or from the equipment manufacturer's shop drawings. Final connections to the equipment shall be made by this Contractor.
1.14 CUTTING AND PATCHING

A. Each Contractor shall be responsible for all cutting and patching required for his work. Carefully lay out all work in advance and where cutting, channeling, chasing, or drilling of building surfaces is necessary for the proper installation of electrical equipment, carefully perform this work in a manner approved by the Architect. Patching shall be done in a neat workmanlike manner by craftsmen skilled in the trade involved and shall be prepared to receive paint. Damaged surfaces shall be repaired at no cost to the Owner. Concrete walls shall be cut only with rotary type drilling tools. Openings through floors and walls may be drilled up to 1" but shall be cored over 1". Electrical equipment shall not be cut with torches, and shall be joined only by bolting (i.e., do not weld wireways to panels, etc.).

1.15 INDUSTRY STANDARDS AND CODES

A. The complete installation shall comply with the applicable Local and State wiring ordinances, with the regulations of the latest edition of the National Electrical Code of the National Fire Protection Association (supplements and official interpretations included) and with the requirements of the Power, Television, and Telephone Companies furnishing service to this installation. The drawings and specifications take precedence when they are more stringent than codes, ordinances, or statutes in effect, and vice versa. In addition, the following latest industry standards, specifications, and codes are minimum requirements.

1. The National Electrical Manufacturer's Association Standards
2. The National Electrical Safety Code
3. Underwriter's Laboratories, Inc., Standards
4. International Building Code
5. International Fire Code
7. State Health Department
8. State Building Codes
9. State Fire Codes
10. State Energy Codes
11. City Building Codes
12. City Electrical Codes
13. State Energy Code

B. All work shall be in accordance with State and Local Codes and requirements of Local Utilities. Where the applicable Building Codes and the drawings or specifications do not agree, the code shall take precedence, but only in cases where what is shown on the drawings or required by the specifications violates the code. Where there is a Code or Utility Company requirement and drawing or specification discrepancy the Code shall have precedence only when it is more stringent than the item specified or shown on the drawings. Items that are allowable by the Local Building Codes, which are less stringent than that required by the specifications or the drawings the less stringent work, shall not be substituted.

1.16 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor and his journeymen shall have Electrical Licenses, as required by the City and State in which work is being performed, and shall provide journeymen to work as superintendents and/or foremen on the project. All workmen shall be skilled in their trade or working under someone who is skilled in the trade and responsible for the work involved.

B. The Contractor shall be totally responsible for his portion of the work from the date of his Contract until final acceptance of the building by the Owner, and must repair all damage sustained without cost to the Owner regardless of cause. The Contractor shall use proper care and diligence in bracing and securing all parts of the work against the elements and shall, in all cases, judge as to the amount of protection required. Proper storage of material shall be maintained at all times.
1.17 FIRE AND SMOKE STOPPAGE
   A. It shall be the responsibility of this Contractor to maintain the fire and smoke integrity of all walls, ceilings, floors etc., through which his work passes through or into. Fire and smoke barriers shall be provided in and around as required by Codes.
   B. Where holes are required to be patched, or conduit, piping, ducts, etc., are required to be patched around, it shall be filled with a material that is UL Classified Standard 1479 for this use and Factory Mutual System approved.

1.18 ACCESS TO EQUIPMENT
   A. All control devices, specialties, pull boxes, disconnect switches, and similar equipment shall be so located as to provide for easy access for operation, repair and maintenance. Access shall conform to Local Electric Codes. Access doors shall be provided if devices are concealed.

1.19 TESTS
   A. At the completion of his work, the Contractor shall perform the following tests in the presence of the Architect.
      1. Test for short circuits and grounds.
      2. Test to prove correct operation of all equipment, including lighting control systems.
      3. Check for balance of load on phases, and connect load to balance as closely as possible. Should the Power Company disclose any unfavorable conditions or reactions on the service, the Contractor shall make changes as may be suggested to properly balance the load.

1.20 CLEAN-UP
   A. The Contractor shall remove all rubbish and debris resulting from his work daily and shall leave equipment that he installed clean and ready for operation.

1.21 RECORD DRAWINGS
   A. Maintain a clean, undamaged set of whiteprints of Contract Drawings. Mark the set to show the actual installation where the installation varies from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
      1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
      2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
      3. Note related Change Order numbers where applicable.
      4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dated and other identification on the cover of each set.
      5. Turn Record Drawings over to the Owner with the Operation and Maintenance Manuals.
      6. 

END OF SECTION 26 01 01
SECTION 26 05 05
DEMOLITION FOR ELECTRICAL

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Electrical and electronic demolition associated with Divisions 26, 27, and 28.

PART 2 PRODUCTS
2.01 MATERIALS AND EQUIPMENT
A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that abandoned wiring and equipment serve only abandoned facilities.
B. Report discrepancies to Engineer before disturbing existing installation.
C. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION
A. Existing Door Access and Video Monitoring Systems: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
A. Remove, relocate, and extend existing installations to accommodate new construction.
B. Remove abandoned wiring to source of supply.
C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
F. Repair adjacent construction and finishes damaged during demolition and extension work.
G. Maintain access to existing equipment and components that remain active. Modify installation or provide access panel as appropriate.
H. Extend existing installations using materials and methods compatible with the existing system or as specified.
I. Where portions of Existing Door Access system are to remain make all permanent wiring connections required and include updates on As-built drawings.

3.04 CLEANING AND REPAIR
A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION 26 05 05
SECTION 26 05 19
ELECTRICAL CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Single conductor building wire.
B. Wiring connectors.

1.02 RELATED REQUIREMENTS
A. Section 07 84 00 - Firestopping.
B. Section 26 05 05 - DEMOLITION FOR ELECTRICAL: Disconnection, removal, and/or extension of existing electrical conductors and cables.
C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
D. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
E. Section 28 10 00 - Access Control
F. Section 28 20 00 - Video Surveillance
G. Section 28 46 00 - DETECTION AND ALARM: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS
H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS
A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
C. Nonmetallic-sheathed cable is not permitted.
D. Underground feeder and branch-circuit cable is not permitted.
E. Service entrance cable is not permitted.
F. Armored cable is not permitted.
G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS
A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Provide new conductors and cables manufactured not more than one year prior to installation.
D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
E. Comply with NEMA WC 70.
F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
J. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
K. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
a. **Exceptions:**
   1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
   2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
   3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

2. **Control Circuits:** 14 AWG.

L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

M. **Conductor Color Coding:**
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. **Color Coding Method:** Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. **Color Code:**
   a. **480Y/277 V, 3 Phase, 4 Wire System:**
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. **208Y/120 V, 3 Phase, 4 Wire System:**
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.
   d. Travelers for 3-Way and 4-Way Switching: Purple.
   e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
   f. For control circuits, comply with manufacturer’s recommended color code.

**2.03 SINGLE CONDUCTOR BUILDING WIRE**

A. **Manufacturers:**
   1. Copper Building Wire:

B. **Description:** Single conductor insulated wire.

C. **Conductor Stranding:**
   1. Feeders and Branch Circuits:
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. **Insulation Voltage Rating:** 600 V.

E. **Insulation:**
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   5. Conductors for Control Circuits: Use crimped terminals for all connections.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      c. NSI Industries LLC: www.nsiindustries.com/#sle.

G. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.
B. Verify that work likely to damage wire and cable has been completed.
C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
D. Verify that field measurements are as indicated.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION
A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION
A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Increase size of conductors as required to account for ampacity derating.
      c. Size raceways, boxes, etc. to accommodate conductors.
   6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer’s instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer’s recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Exposed Cable Installation (only where specifically permitted):
   1. Route cables parallel or perpendicular to building structural members and surfaces.
   2. Protect cables from physical damage.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

H. Install conductors with a minimum of 12 inches of slack at each outlet.
I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
K. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Correct deficiencies and replace damaged or defective conductors and cables.

C. END OF SECTION 26 05 19
SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.

1.02 RELATED REQUIREMENTS
A. Section 26 05 19 - ELECTRICAL CONDUCTORS AND CABLES: Additional requirements for conductors for grounding and bonding, including conductor color coding.
B. Section 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS: Additional grounding and bonding requirements for cable tray systems.
C. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
D. Section 26 56 00 - LIGHTING: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2  PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS
A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
D. Grounding System Resistance:
1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
      b. Metal gas piping.

F. Communications Systems Grounding and Bonding:
   1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
   2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
      a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
      b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
      c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
      d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Cable Tray Systems: Also comply with Section 26 05 36.

H. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
4. Manufacturers - Mechanical and Compression Connectors:
5. Manufacturers - Exothermic Welded Connections:

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
D. IDENTIFY GROUNDING AND BONDING SYSTEM COMPONENTS IN ACCORDANCE WITH SECTION 26 05 53.

END OF SECTION 26 05 26
SECTION 26 05 29
AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS
A. Section 26 05 33.13 - CONDUIT: Additional support and attachment requirements for conduits.
B. Section 26 05 33.16 - BOXES: Additional support and attachment requirements for boxes.
C. Section 26 56 00 - LIGHTING: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 QUALITY ASSURANCE
A. Comply with NFPA 70.
B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS
A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.25. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel or stainless steel unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Manufacturers:

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
   1. Manufacturers:

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Channel Material:
      a. Indoor Dry Locations: Use galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Manufacturers:
      c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
      d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
e. Outlet Boxes: 1/4 inch diameter.
f. Luminaires: 1/4 inch diameter.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use wood screws.
   9. Plastic and lead anchors are not permitted.
  10. Powder-actuated fasteners are not permitted.
  11. Hammer-driven anchors and fasteners are not permitted.
  12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      b. Channel Material: Use galvanized steel.
      c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
  13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
  14. Manufacturers - Mechanical Anchors:

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that mounting surfaces are ready to receive support and attachment components.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
   D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   E. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
   F. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
   G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
   H. Equipment Support and Attachment:
      1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
      2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: Also comply with Section 26 05 33.13.
J. Cable Tray Support and Attachment: Also comply with Section 26 05 36.
K. Box Support and Attachment: Also comply with Section 26 05 33.16.
L. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
M. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.
N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
O. Secure fasteners according to manufacturer's recommended torque settings.
P. Remove temporary supports.

3.03 FIELD QUALITY CONTROL
A. Inspect support and attachment components for damage and defects.
B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 05 29
SECTION 26 05 33.13
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. Electrical metallic tubing (EMT).
D. Rigid polyvinyl chloride (PVC) conduit.
E. Conduit fittings.
F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.
B. Section 26 05 19 - ELECTRICAL CONDUCTORS AND CABLES.
C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
D. Section 26 05 29 - AND SUPPORTS FOR ELECTRICAL SYSTEMS.
E. Section 27 10 05 - STRUCTURED CABLES: Additional requirements for communications systems conduits.
F. Section 28 10 00 - Access Control
   1. Additional requirements for Sections 281313 and 281316.
G. Section 28 20 00 - Video Surveillance
H. Section 28 46 00 - Fire Detection and Alarm

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
G. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer’s instructions.

PART 3 EXECUTION

2.01 EXAMINATION
A. Verify that mounting surfaces are ready to receive conduits.
B. Verify that conditions are satisfactory for installation prior to starting work.

2.02 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Mechanical equipment rooms.
   c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route conduits exposed:
   a. Across floors.
   b. Across roofs.
   c. Across top of parapet walls.
   d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
   a. Heaters.
   b. Hot water piping.
   c. Flues.
14. Group parallel conduits in the same area together on a common rack.

D. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use of spring steel conduit clips for support of conduits is not permitted.
   a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
   b. Spring clips shall not be used to support conduits to ceiling support wires.

9. Use of wire for support of conduits is not permitted.

10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

E. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.

2. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs.

3. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

4. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

F. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Provide suitable modular seal where conduits penetrate exterior wall below grade.

7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

G. Underground Installation:
1. Provide trenching and backfilling as required.

2. Minimum Cover, Unless Otherwise Indicated or Required:

3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.
H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where conduits are subject to earth movement by settlement or frost.

I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

J. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

K. Provide grounding and bonding in accordance with Section 26 05 26.

L. Install no more than equivalent of four 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 1 1/4 inch size.

2.03 FIELD QUALITY CONTROL
   A. Correct deficiencies and replace damaged or defective conduits.

2.04 CLEANING
   A. Clean interior of conduits to remove moisture and foreign matter.

2.05 PROTECTION
   A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
SECTION 26 05 33.16
BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
C. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.
B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
C. Section 26 05 29 - AND SUPPORTS FOR ELECTRICAL SYSTEMS.
D. Section 26 05 33.13 - CONDUIT:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
E. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
F. Section 26 27 26 - DEVICES:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.
G. Section 27 10 05 - STRUCTURED CABLING: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS
2.01 BOXES
A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use suitable concrete type boxes where flush-mounted in concrete.
5. Use suitable masonry type boxes where flush-mounted in masonry walls.
6. Use raised covers suitable for the type of wall construction and device configuration where required.
7. Use shallow boxes where required by the type of wall construction.
8. Do not use "through-wall" boxes designed for access from both sides of wall.
9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
13. Minimum Box Size, Unless Otherwise Indicated:
   a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
   b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
15. Manufacturers:
   e. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
   1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA 250 Environment Type, Unless Otherwise Indicated:
      a. Indoor Clean, Dry Locations: Type 1, painted steel.
      b. Outdoor Locations: Type 3R, painted steel.
   3. Junction and Pull Boxes Larger Than 100 cubic inches:
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Underground Boxes/Enclosures:
   1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
   2. Size: As indicated on drawings or as required.
   3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
   4. Provide logo on cover to indicate type of service.
   5. Applications:
      a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
   6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
      a. Manufacturers:
         1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.
         b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that mounting surfaces are ready to receive boxes.
   B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
   C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
   D. Provide separate boxes for emergency power and normal power systems.
   E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
   F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
   G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
   H. Box Locations:
      1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
   a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
   b. Communications Systems Outlets: Comply with Section 27 10 05.
   c. Fire Alarm Devices: Comply with Section 28 3100.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location
   at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide
   minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls
   back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire
   resistance will not be reduced.
   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide
      minimum 24 inches separation where wall is constructed with individual
      noncommunicating stud cavities or protect both boxes with listed putty pads.
   b. Do not install flush-mounted boxes with area larger than 16 square inches or such
      that the total aggregate area of openings exceeds 100 square inches for any 100
      square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of
    conductors, and to limit conduit length and/or number of bends between pulling points in
    accordance with Section 26 05 33.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or
    approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.
I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using
      suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other
      than boxes used for fixture support) supported by threaded conduit connections in
      accordance with NFPA 70. Do not provide support from piping, ductwork, or other
      systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling
      support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow
      stud walls. Repair or replace supports for boxes that permit excessive movement.
J. Install boxes plumb and level.
K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so
      that front edge of box or associated raised cover is not set back from finished surface
      more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or
      associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile,
      gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the
      edge of the box.
L. Install boxes as required to preserve insulation integrity.
M. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
3. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 05 26.

S. Identify boxes in accordance with Section 26 05 53.

T. Secure flush mounting box to interior wall and partition studs with external to box fasteners. Accurately position to allow for surface finish thickness.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 05 33.16
SECTION 26 05 33.23
SURFACES RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Surface raceway systems.

1.02  RELATED REQUIREMENTS
A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - AND SUPPORTS FOR ELECTRICAL SYSTEMS.
C. Section 26 05 33.13 - CONDUIT.
D. Section 26 05 33.16 - BOXES.
E. Section 26 27 26 - DEVICES: Receptacles.

1.03  REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

1.04  ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 33.16 and conduit provided under Section 26 05 33.13 as required for installation of raceways provided under this section.
   3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install raceways until final surface finishes and painting are complete.
   2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.05  SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
   1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.
B. Shop Drawings:
   1. Submit product date indicating all accessories, sizes, etc. to be provided.

1.06  QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

PART 2  PRODUCTS

2.01  RACEWAY REQUIREMENTS
A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS
A. Manufacturers:
B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
C. Surface Raceway System:
   1. Raceway Type: Single channel, painted steel.
   2. Size: Sized to comply with NFPA 70, but not smaller than Wiremold 700 Series for power circuits and 2400 Series for low voltage circuits.
   3. Color: Painted to match adjacent finishes.
   4. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
B. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Install products in accordance with manufacturer’s instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install raceways plumb and level.
D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer’s requirements.
   1. Use 2-hole straps for supporting all 700 Series raceway.
F. Close unused raceway openings.
G. Provide grounding and bonding in accordance with Section 26 05 26.
H. All surface raceway shall be painted to match existing finishes.

3.03 CLEANING
A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 05 33.23
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Electrical identification requirements.
   B. Identification nameplates and labels.
   C. Wire and cable markers.

1.02 RELATED REQUIREMENTS
   A. Section 26 05 19 - ELECTRICAL CONDUCTORS AND CABLES: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
   B. Section 262726 - Wiring Devices
   C. Section 27 10 05 - STRUCTURED CABLEING: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS
   A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
   B. Sequencing:
      1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
      2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.

1.06 FIELD CONDITIONS
   A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS
   A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
      1. All existing cameras and Door Access devices not currently labelled shall be labelled per project specifications.
      2. Where cameras or Door Access devices are currently labelled, modify as needed to reflect new project nomenclature, correct door numbers, etc.
   B. Identification for Equipment:
      1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
         a. Panelboards:
            1) Identify ampere rating.
            2) Identify voltage and phase.
            3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

2. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Identification for Communications Conductors and Cables: Comply with Section 27 10 05.
3. Use underground warning tape to identify direct buried cables.

D. Identification for Raceways:
1. Use factory painted conduits to identify specified systems.
   a. Where conduits are exposed in finished spaces they shall be painted to match existing surfaces.
   b. Color Code
      1) Fire Alarm: Red
      2) Security Camera: Yellow
      3) Security: Green
2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

E. Identification for Boxes:

F. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 05.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
3. Use identification label to identify fire alarm system devices, Video cameras and Door Access equipment.
   a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location. Including:
      1) New and existing power supplies and controllers for Door Access System.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   a. Use only for indoor locations.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. System designation where applicable:
      b. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch.
      b. Equipment Designation: 1/2 inch.
      c. Other Information: 1/4 inch.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe
      operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   5. Color: Black text on white background unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS
A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around
   self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split
   sleeve type markers suitable for the conductor or cable to be identified.
B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable
   ties.
C. Legend: Power source and circuit number or other designation indicated.
D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
   1. Do not use handwritten text.
E. Minimum Text Height: 1/8 inch.
F. Color: Black text on white background unless otherwise indicated.

PART 3 EXECUTION
3.01 PREPARATION
A. Clean surfaces to receive adhesive products according to manufacturer’s instructions.

3.02 INSTALLATION
A. Install products in accordance with manufacturer’s instructions.
B. Install identification products to be plainly visible for examination, adjustment, servicing, and
   maintenance. Unless otherwise indicated, locate products as follows:
   4. Interior Components: Legible from the point of access.
   5. Conduits: Legible from the floor.
   6. Boxes: Outside face of cover.
   7. Conductors and Cables: Legible from the point of access.
C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to
   interior surfaces using self-adhesive backing or epoxy cement.
E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or
   wrinkles and edges properly sealed.
F. Mark all handwritten text, where permitted, to be neat and legible.
3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 05 53
SECTION 26 05 83
CONNECTIONS

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS
A. Section 26 05 19 - ELECTRICAL CONDUCTORS AND CABLES.
B. Section 26 05 33.13 - CONDUIT.
C. Section 26 05 33.16 - BOXES.
D. Section 26 27 26 - DEVICES.
E. Section 26 28 16.16 - ENCLOSED SWITCHES.

1.03 REFERENCE STANDARDS
A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.
B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2  PRODUCTS

2.01 MATERIALS
A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
C. Wiring Devices: As specified in Section 26 27 26.
D. Flexible Conduit: As specified in Section 26 05 33.13.
E. Wire and Cable: As specified in Section 26 05 19.
F. Boxes: As specified in Section 26 05 33.16.

PART 3  EXECUTION

3.01 EXAMINATION
A. Verify that equipment is ready for electrical connection, wiring, and energization.
3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. END OF SECTION 26 05 83
SECTION 26 27 16
CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Hinged cover enclosures.
   B. Cabinets.
   C. Accessories.

1.02 RELATED REQUIREMENTS
   A. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS
   B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.

1.04 QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.
   B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 MAINTENANCE MATERIALS
   A. Furnish two of each key.

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES
   A. Construction: NEMA 250, Type 1 steel enclosure.
   B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.
   C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
   D. Enclosure Finish: Manufacturer's standard enamel.

2.02 CABINETS
   A. Boxes: Galvanized steel.
   C. Fronts: Steel, flush or surface type, as shown on the drawings, with screw cover front, door with concealed hinge, and flush lock, keyed to match branch circuit panelboard. Finish with gray baked enamel.
   D. Provide metal barriers to form separate compartments wiring of different systems and voltages.
   E. Provide accessory feet for free-standing equipment.
   F. Keys: Provide two of each different key.

2.03 ACCESSORIES
   A. Plastic Raceway: Plastic channel with hinged or snap-on cover.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 26 0529.
C. Install cabinet fronts plumb.

3.02 CLEANING
A. Clean electrical parts to remove conductive and harmful materials.
B. Remove dirt and debris from enclosure.
C. Clean finishes and touch up damage.
D. 

END OF SECTION 26 27 16
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Wall switches.
B. Wall dimmers.
C. Receptacles.
D. Wall plates.
E. Floor box service fittings.

1.02 RELATED REQUIREMENTS
A. Section 26 05 19 - ELECTRICAL CONDUCTORS AND CABLES: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 33.16 - BOXES.
D. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
E. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.
F. Section 27 10 05 - STRUCTURED CABLING: Voice and data jacks.

1.03 REFERENCE STANDARDS
B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS
A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.
B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
C. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFCI Receptacles: Include information on status indicators.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION
A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS
2.01 WIRING DEVICE APPLICATIONS
A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide GFI protection for all receptacles installed within 6 feet of sinks and other locations as required by the NEC.
E. Provide GFCI protection for receptacles installed in kitchens.
F. Provide GFCI protection for receptacles serving electric drinking fountains.
G. For flush floor service fittings, use tile rings for installations in tile floors.
H. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES
A. Provide wiring device finishes as described below unless otherwise indicated.
B. Wiring Devices Installed in Finished Spaces: Gray with stainless steel wall plate.
C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
D. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.
E. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

2.03 WALL SWITCHES
A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

1. LED Lighting

D. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.05 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

B. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.


3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.06 WALL PLATES

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.


3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.07 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:

B. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
   1. Single Service Flush Convenience Receptacles:
      a. Cover: Round.
   2. Single Service Flush Communications Outlets:
      a. Cover: Round.
      b. Configuration: As indicated on Plans.
   3. Dual Service Flush Combination Outlets:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: Two standard convenience duplex receptacle(s) with duplex flap opening(s).
         2) Communications: Provide required communications brackets and faceplates.
   4. Accessories:
      a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
      b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Install hospital grade receptacles in all patient care areas, standard grade receptacles in other areas.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.
3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA
130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for
installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
   a. Wall Switches: 48 inches above finished floor.
   b. Wall Dimmers: 48 inches above finished floor.
   c. Receptacles: 18 inches above finished floor or 4 inches above top of
counter/backsplash.
   d. Voice and Data Outlets: 18 inches above finished floor or 4 inches above top of
counter/backsplash.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same
location and at the same mounting height, gang devices together under a common wall
plate. Provide voltage separation as required.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of
door frame. Where locations are indicated otherwise, notify Engineer to obtain direction
prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain
according to manufacturer's instructions. Ground fault device shall be installed in an
accessible location.

C. Install wiring devices in accordance with manufacturer’s instructions.

D. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not
connect more than one conductor to wiring device terminals.

E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and
tightening to proper torque specified by the manufacturer. Where present, do not use push-in
pressure terminals that do not rely on screw-actuated binding.

F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit
equipment grounding conductor and to outlet box with bonding jumper.

G. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through
protection to downstream devices. Label such devices to indicate they are protected by
upstream GFCI protection.

H. Install wiring devices plumb and level with mounting yoke held rigidly in place.

I. Install wall switches with OFF position down.

J. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as
instructed by manufacturer.

K. Do not share neutral conductor on branch circuits utilizing wall dimmers.

L. Where required by wall dimmer manufacturer provide separate conduit for 0-10V control
conductors.

M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted
receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely
covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or
improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this
requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or
designated for future use.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING
A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING
A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26
SECTION 26 56 00
LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Exterior luminaires.
B. Poles and accessories.

1.02 RELATED REQUIREMENTS
A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 33.16 - BOXES.
D. Section 26 51 00 - INTERIOR LIGHTING.

1.03 REFERENCE STANDARDS
B. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.
G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS
A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
   3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 COORDINATION
A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

PART 2 PRODUCTS
2.01 LUMINAIRE TYPES
A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES
A. Provide products that comply with requirements of NFPA 70.
B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.
D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
H. Recessed Luminaires:
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. LED Luminaire Components: UL 8750 recognized or listed as applicable.
K. Exposed Hardware: Stainless steel.

2.03 POLES

A. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Comply with AASHTO LTS.
      b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
         1) Design Wind Speed: ______ miles per hour, with gust factor of 1.3.
      c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
   3. Material: Steel, unless otherwise indicated.
   4. Shape: Square tapered, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   7. Unless otherwise indicated, provide with the following features/accessories:
      a. Top cap.
      b. Handhole, 2x4 size.
      c. Anchor bolts with leveling nuts or leveling shims.
      d. Metallic Anchor base cover.
      e. Internal vibration dampers.

B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
B. Verify that suitable support frames are installed where required.
C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer’s instructions.
D. Install luminaires in accordance with NECA/IESNA 501.
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Install canopies tight to mounting surface.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Pole-Mounted Luminaires:
1. Maintain the following minimum clearances:
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
   a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
      1) Install anchor bolts plumb per template furnished by pole manufacturer.
      2) Position conduits to enter pole shaft.
   b. Install foundations plumb.
   c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
   d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   e. Install anchor base covers as indicated.
3. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   b. Provide supplementary ground rod electrode as specified in Section 26 05 26 at each pole bonded to grounding system as indicated.
4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

J. Install accessories furnished with each luminaire.
K. Bond products and metal accessories to branch circuit equipment grounding conductor.
L. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL
A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.05 ADJUSTING
A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

3.06 CLEANING
A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
3.07 CLOSEOUT ACTIVITIES

3.08 PROTECTION
   A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 56 00
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.
B. Communications pathways.
C. Copper cable and terminations.
D. Communications pathway fittings.
E. Communications outlets.
F. Communications grounding and bonding.
G. Communications identification.
H. Distribution frames, cross-connection equipment, enclosures, and outlets.
I. Grounding and bonding the telecommunications distribution system.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 33.13 - CONDUIT.
D. Section 26 05 33.16 - BOXES.
E. Section 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS.
F. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products.
G. Section 26 27 26 - DEVICES.

1.03 REFERENCE STANDARDS

A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.
F. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; Rev C, 2009 (with Addenda; 2014).
I. TIA-598-C - Optical Fiber Cable Color Coding; Rev C, 2005.
M. UL 444 - Communications Cables; Current Edition, Including All Revisions.
N. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.
1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   2. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer’s standard catalog pages and data sheets for each product.
C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
D. Manufacturer Qualifications.
E. Evidence of qualifications for installer.
F. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
H. Field Test Reports.
I. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.
J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer’s unopened packaging until ready for installation.
B. Keep stored products clean and dry.

1.08 WARRANTY

A. Correct defective Work within a 2 year period after Date of Substantial Completion.
B. Provide manufacturers standard warranty, minimum 20 years for a complete system, including all cabling, jacks, and patch panels.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cabling and Equipment:
   1. Panduit Company.
   2. General Cable

2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for communications, including cables, cable or basket trays, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569-C (pathways), latest editions (commercial standards).
   2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607-B and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
   1. Building Entrance Cable: By others.
   2. Horizontal Cabling: Copper.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.03 PATHWAYS

A. Conduit: As specified in Section 26 05 33.13; provide pull cords in all conduit.

2.04 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568-C.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568-C.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   3. Cable Type: Category 6E UTP.
   4. Cable Capacity: 4-pair.
   5. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
   6. Cable Jacket Color:
      a. Video Surveillance Cameras: Yellow
      b. Door Access System: Green
   7. Product(s):
a. General Cable
   1) Category 6e Cable: Genspeed 6000 Enhanced

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
   1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
      a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
      b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
      c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
      d. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606-B.
      e. Provide incoming cable strain relief and routing guides on back of panel.

B. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
   1. Size: As indicated on drawings.
   2. Do not paint over UL label.

C. Equipment Racks and Cabinets: EIA/ECA-310 standard 19 inch wide component racks.
   1. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
   2. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

2.06 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 05 33.16.
   1. Provide depth as required to accommodate cable manufacturer’s recommended minimum conductor bend radius.
   2. Minimum Size, Unless Otherwise Indicated:
      a. Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

B. Wall Plates:
   1. Comply with system design standards and UL 514C.
   2. Accepts modular jacks/inserts.
   3. Provide Panduit Mini-Com Ultimate ID Executive Series sloped wall plates. All plates shall be 4 port with blanks for unused jacks.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607-B.

B. Comply with Section 26 05 26.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.
B. Comply with TIA-606-B.
C. Comply with Section 26 05 53.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569-C (pathways), TIA-607-B (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
B. Comply with Communication Service Provider requirements.
C. Grounding and Bonding: Perform in accordance with TIA-607-B and NFPA 70.
D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches from power conduits and cables and panelboards.
   3. 5 inches from fluorescent and high frequency lighting fixtures.
   4. 6 inches from flues, hot water pipes, and steam pipes.
B. Conduit, in Addition to Requirements of Section 26 05 33.13:
   1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
   2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
   3. Arrange conduit to provide no more than 100 feet between pull points.
   4. Do not use conduit bodies.
C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         1) Telephone and Data Outlets: 18 inches above finished floor.
         2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 46 inches above finished floor to top of telephone.
         3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 46 inches above finished floor to top of telephone.
      b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
      e. Locate outlet boxes so that wall plate does not span different building finishes.
      f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
5. Cabling shall be installed parallel and perpendicular to building structure. Supported a maximum 4-6 ft.
6. Install cabling in raceways and/or cable tray system.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches.
   2. At Outlets - Copper: 12 inches.

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
   3. Use T568B wiring configuration.

D. Wall-Mounted Racks and Enclosures:
   1. Install to plywood backboards only, unless otherwise indicated.
   2. Mount so height of topmost panel does not exceed 78 inches above floor.

E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

F. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts or identification labels to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test operation of shorting bars in connection blocks.
   2. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
   3. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

F. END OF SECTION 27 10 05
PART 1 GENERAL

1.01 PROJECT DESCRIPTION

A. Provide full turnkey SMS Security Management System with Access Control.

1.02 SUMMARY

A. Section includes the S2 Security Corporation [S2 NetBox®/S2 NetBox® Enterprise] Security and Database Management System (SMS) consisting of computer hardware, software, and associated licensing and equipment for monitoring, recording, and managing Electronic Access Control System (EACS) and Integrated Systems (IS) data and functionality.

B. The SMS shall meet the requirements of business and government access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring (Video Monitoring System), and communications loss monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

C. The SMS includes the following sub-components:
   1. Operating Systems (OS) software and firmware
   2. Application Software
   3. Database Software
   4. Network connected Security Management Servers
   5. Network connected field level panels

D. The SMS shall be integrated with monitoring and control systems specified in the following specification sections:
   1. 282000 - Video Surveillance
   2. 282013 - Milestone Video Management System

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including:
   1. Related Specification Sections:
      a. 087100 - Door Hardware
      b. 260101 - Common Electrical Work
      c. 260519 - Low-Voltage Electrical Conductors and Cables
      d. 260533.13 - Conduit for Electrical Systems
      e. 260533.16 - Boxes for Electrical Systems
      f. 260553 - Identification for Electrical Systems
      g. 281313 - S2 Security Global Security Operations Center
      h. 282000 - Video Surveillance
      i. 282013 - Milestone Video Management System

1.04 DEFINITIONS

A. API: Application Programming Interface
B. AVI: Audio Video Interleave
C. CA: Certificate Authority
D. CAC: Common Access Card
E. CE: European Union Conformity
F. CPU: Central Processing Unit
G. CSV: Comma Separated Values
H. DNS: Domain Name Server
I. DSM: Door Status Monitor
J. DVR: Digital Video Recorder
K. EACS: Electronic Access Control System
L. FCC: Federal Communications Commission
M. FIPS: Federal Information Processing Standard
N. FIFO: First In - First Out
O. FTP: File Transfer Protocol
P. FRAC: First Responder Authentication Credential
Q. GB: Gigabyte
R. GSOC: Global Security Operations Center
S. HA: High Availability
T. HTML: Hypertext Markup Language
U. H.264: Video Compression Standard
V. I2C: Inter-Integrated Circuit
W. IEEE: Institute of Electrical and Electronics Engineers
X. I/O: Input / Output
Y. IP: Internet Protocol
Z. IS: Integrated System
AA. JPEG: Joint Photographic Experts Group
AB. LAN: Local Area Network
AC. LDAP: Lightweight Directory Access Protocol
AD. MB: Megabyte
AE. MJPEG: Motion JPEG
AF. MSATA: Mini-Serial Advanced Technology Attachment
AG. MSP: Mobile Security Professional
AH. MTBF: Mean-Time Between Failure
AI. NAS: Network Attached Storage
AJ. NAT: Network Address Translation
AK. NBAPI: NetBox Application Programming Interface
AL. NECA: National Electric Code Association
AM. NFPA: National Fire Protection Association
AN. NVR: Network Video Recorder
AO. ODBC: Open Database Connectivity
AP. OS: Operating System
AQ. OVID: Open Video Integration Driver
AR. PDF: Portable Document Format
AS. PIN: Personal Identification Number
AT. PIV: Personal Identity Verification
AU. PoE: Power over Ethernet
AV. PTZ: Pan-Tilt-Zoom
AW. RAID: Redundant Array of Independent Disks
1.05 PERFORMANCE REQUIREMENTS
A. The S2 SMS shall be certified to meet the following standards:
   1. ISO 9000
   2. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing as stated in the Environmental Design of Electrical Equipment Act (EDEE)
   3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application
   4. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”
   5. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”
   6. Electronic data exchange between Video Surveillance System and an Access Control System shall comply with SIA TVAC
   8. Installation shall comply with federal, state, and local codes and Authority Having Jurisdiction (AHJ)

1.06 ACTION SUBMITTALS
A. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.
B. Shop Drawings: Include system line diagrams, equipment locations, installation details, and system integration plans.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types, quantities, and sizes.
   3. Plans and Elevations: Dimensioned plans and elevations of equipment racks, enclosures, and conduit interconnections, including access and workspace requirements.
   4. Data Calculations: Provide data bandwidth and storage calculations, including data backup and archive configuration details meeting the minimum project requirements as described herein.
   5. Power and Heat Load Calculations: Provide power and heat load calculations for all hardware, including UPS capacity calculations.
   6. Wiring Diagrams: For power and signal wiring.

C. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.

D. Testing: Plans with labeling to match field identification and check list for each portal indicating proper operation of each component and system programming.

1.07 INFORMATIONAL SUBMITTALS

A. ISO9000 Listing Certificates
B. CE and FCC Compliance Certificates:
C. Field quality-control reports
D. Current S2 Security Integrator Certification Letter
E. Current S2 Security Training Certificates (listing expiration dates) for two (2) technicians from the supporting office that will be on-site.
F. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner.

1.08 CONTRACTOR REQUIREMENTS

A. The Contractor shall have a supporting office within two-hundred (200) of the project location.
B. Certifications: Two (2) technicians from the supporting office shall hold current certifications with S2 Security.
C. On-site maintenance and repair service shall be available locally and within four (4) hours of notification of condition.
D. On-site Contractor personnel shall hold all required local, state, and federal licenses.
E. On-site Contractor personnel shall hold current certifications with S2 Security.
F. The Contractor shall provide three (3) references for completed projects of similar scope.
G. List Approved Integrators shall be provided by Addendum following mandatory Pre-Bid walkthrough.

1.09 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For all components and software to include in emergency, operation, and maintenance manuals.
   1. Extra Materials:
      a. Return all left-over (unused) product and materials to the Owner.
2. Applicable operating system, database, client, and application software on portable storage media.
3. Full System Backup as of closeout date on portable storage media.
4. Submit one (1) printed and one (1) electronic copy of project binder in final form. This copy shall contain as a minimum:
   a. Table of Contents for each element.
   b. Contractor information - names phone numbers, and email for sales, technical support, and consumables reordering.
   c. Lists of spare parts and replacement components recommended to be stored at the site for ready access
   d. Datasheets for all equipment
   e. Operation and maintenance manuals for all equipment
   f. Operation and maintenance procedures not covered in manufacturer’s manuals
   g. Training:
      1) Program Syllabus.
      2) Manual(s) and Material(s).

B. Provide final testing documentation.

1.10 QUALITY ASSURANCE
A. Installation shall comply with federal, state, and local codes and Authority Having Jurisdiction (AHJ).
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. All software and hardware shall be programmed and installed in accordance with manufacturer’s specifications.
D. All equipment shall be new, in current production, and the standard products of a manufacturer of ESS equipment.
E. Manufacturer shall guarantee availability of parts, for a minimum of <seven (7)> years from date of shipment.
F. On-site maintenance and repair service shall be available locally and within <four (4) hours> of notification of condition.
G. Contractor shall review drawings and specifications.
H. Software integration between all integrated systems shall be tested and certified for interoperability by the manufacturer of each system.
I. Software integration between the SMS, VMS, and all other integrated system components shall be tested and certified for interoperability by the manufacturers of each system.

1.11 PERMITS
A. All permits required for the specified performance and completion of the work shall be secured by the Contractor.

1.12 PROJECT CONDITIONS
A. Environmental Conditions: System components shall withstand the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Interior Environmentally Controlled Space: Rated for continuous operation in ambient temperatures of 32° to 95° F (0° to 35° C) dry bulb and a relative humidity of 20 to 80 percent, noncondensing.

1.13 WARRANTY
A. Manufacturer’s standard form in which manufacturer agrees to service, repair or replace system components as needed for proper system operation as specified herein.
B. Warranty Period: a 2-year warranty on hardware and a 1-year warranty on labor and software from date of date of Owner Acceptance.
PART 2 PRODUCTS

2.01 OPERATIONAL REQUIREMENTS

A. The SMS shall be implemented through network appliance architecture with a three-tier modular hardware hierarchy and embedded three-tier software architecture.

1. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.

2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.

3. Security of the data communicated over the network to and from the browser, Network Controller, and field panels shall be protected by TLS protocol encryption. The connection shall use TLSv1.2, GCM mode and a 2048-bit RSA key.

4. The top hardware tier shall be the Network Controller. Embedded on the Network Controller shall be an operating system, a web server, security application software, and the database of personnel and system activity. Converged Video Access systems shall also include fully functional network video recorder.

5. The middle hardware tier shall be the Network Node. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application Blades connected to the system’s inputs, outputs, and readers. This modular design shall make it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs shall be automatically re-integrated.

6. The bottom hardware tier shall be the Application Blades. Four unique Application Blades shall be available:
   a. Access Control Blade: shall support two readers, four supervised inputs, and four relay outputs.
   b. Alarm Input Blade: shall support eight supervised inputs.
   c. Relay Output Blade: shall support eight relay outputs.
   d. Temperature Blade: shall support eight analog temperature sensor inputs.

B. The SMS shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.

1. The database tier shall use PostgreSQL. PostgreSQL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and a high reliability relational database that is embedded without requiring the use of a separate PC server.

2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.

3. The security application software tier contains the business logic. This application shall also be embedded on the Network Controller and requires no additional memory or processing power.

4. This three-tiered embedded software design runs within an embedded Linux Ubuntu 16.04 LTS operating system and shall require no client-side software other than a web browser.

C. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer’s system.

D. All S2 systems and components shall have been thoroughly tested and proven in actual use.

2.02 FUNCTIONAL REQUIREMENTS

A. The system shall support the S2 Global® product offering. S2 Global is a global security operations center (GSOC) application enabling system operators and administrators to monitor...
and control multiple distributed S2 NetBox installations simultaneously. The Network Controller can be configured to use Network Address Translation (NAT) to communicate with an S2 Global system.

B. The system shall support the S2 High Availability (HA) Solution. The HA Solution includes an HA server pair consisting of two S2 NetBox Enterprise 100 servers running Stratus Technologies everRun® Express high availability virtualization software. The servers act as a platform for the S2 software and operating system as a virtual machine on one server, which is continually backed up on the other server.

C. Widget Desktop: The SMS shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop.
   1. Each widget shall provide easy access to a frequently used function—allowing users to, for example, view an Activity Log, a camera view, or real-time web content.
   2. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which widgets are available in a layout and the extent to which users can customize the layout. Setup privileges shall enable administrators to switch from “Compose Mode” to “Monitoring Mode” from the desktop menu.
   3. When composing layouts, system administrators shall have the ability to display a grid overlay on the Widget Desktop background. Whenever a widget is moved or resized, it will align with (or “snap to”) the nearest intersection of lines in the grid. If the grid is saved with the layout, it will appear in the background when users view the layout.
   4. The widgets that shall be available for layouts are: Activity Log, Alarm Workflow, Auto-Monitor, Camera View, Clock, Duty Log Entry, Elevator Status, Events, Explorer, Floorplans, Intrusion Panel, Passback Grace, Photo ID History, Portal Status, Portal Unlock, Statistics Block, Status, and Threat Level.

D. System Partitioning: The system administrator shall have the ability to divide the SMS into partitions, allowing subsets of the overall population and/or resources to be managed separately.
   1. From the default Master partition, one or more additional partitions can be created.
   2. Each partition shall contain some number of administrators, card holders with their credentials and resources.
   3. When performing administrative functions, the administrator of a partition shall have the ability to affect only the cardholders and resources in that partition. However, resources can be shared across partitions through the access level assignments in another partition.
   4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.
   5. Administrators shall have the ability to search for person records across all partitions to which they have access. The system administrator shall have the ability to make such cross-partition searches the default for users who have access to multiple partitions.
   6. After finding a person record located in another partition, an administrator shall be able to click a button to switch to that partition directly from the person record—and possibly edit the record, depending on his or her access rights in that partition. Alternatively, provide the option for making every person record seamlessly visible across all partitions.

E. The SMS shall provide the following Access Control capabilities:
   1. Login throttling, which can be enabled for the system to limit the number of login attempts from the same IP address for a selectable duration.
   2. Integrated photo ID creation capability.
   3. Photo ID and video verification during access control monitoring.
   4. User interface secured access under encrypted password control.
   5. System-wide timed anti-passback function.
   6. Regional anti-passback with mustering and roll call functions.
   7. Region occupancy counting and control.
   8. “First-in-unlock” rule enforcement.
9. Multiple access levels and cards per person.
10. 128-bit card support for Wiegand card readers.
11. Detailed time specifications.
12. Simultaneous support for multiple card data formats.
13. Elevator control with or without floor selection tracking.
15. Scheduled portal unlocks by time and threat level.
17. Card enrollment by reader or keyboard.
18. Compatibility with various input devices, including biometric readers.
19. Activation/expiration date/time by person with one-minute resolution.
20. Access level disable for immediate lockdown.
21. Use of Threat Levels to alter security system behavior globally.
22. Duress PINs, which can be enabled for the system to allow a valid user to raise an alarm if compelled under duress to use his or her credentials (card and PIN) to allow access for another person.
23. Multiple holiday schedules.
24. Timed unlock schedules.
25. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.
26. Optional two-man access restriction for portals, requiring two valid card reads from two separate cardholders within a specified amount of time for portal entry.
27. Card enrollment reader support.
29. Wiegand Reader support.
30. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.
31. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
32. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.
33. Integration with supported alarm panels.
34. Support for up to 200 DMP and 255 BOSCH intrusion panels with high-level TCP/IP integration.
35. Optional storage and recall of ID photos and personal/emergency data.
36. Unlimited person records.
37. Up to 150,000 credentials are stored locally at the Network Node. An unlimited number of credentials may be authenticated with the Network Controller, caching up to 150,000 of the most frequently used credentials on the Network Node. In an instance where the credential is not stored locally at the Network Node, the Network Node will attempt to confirm access by verifying the existence of the credential with the Network Controller.
38. Unlimited number of scheduled actions, with the Network Controller downloading up to 16 per Network Node per day of the soonest-to-activate actions applying to that Network Node, with any others that remain in the database as candidates for downloading later. Expired scheduled actions are removed automatically.
39. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected on the person record.
40. Search for person records using a credential scan.

F. The SMS shall provide the following Monitoring capabilities:
1. The Monitoring Home page shall allow users to view a full system summary, including the Activity Log, Auto-Monitor, and links to frequent User Tasks.
2. Common alarm panel integration for disarm on access, and arm on egress.
3. Support for the direct viewing of IP cameras.
4. Integrated real-time IP-based S2 NetVR® systems and compatible third-party NVR systems with stored video replay for events.
5. Provides alarms on video loss, video motion detection, and video restore events.
7. Provides alarms on communication loss and temperature variation.
8. Support for the creation of custom sets of alarm event actions.
9. Provides the ability to record video and link to video for alarm events based on access control activity.
10. Available video control and playback through the SMS user interface.
11. Provides the ability to assign threat levels to various alarm events according to severity.
12. Provides the ability to select up to 20 levels of priority for event actions.
13. Provides the ability to enter a duty log comment into the Activity Log, or to append a unique or preset comment to a particular log entry while viewing the Activity Log.
14. Support for the display of Activity Log entries that include both the time the event occurred on the Network Node and the time it was reported to the Network Controller.
15. Support for electronic supervision of alarm inputs.
16. Support for the use of output relays for enabling circuits under alarm event control.
17. A monitoring desktop that integrates video, system Activity Logs, floorplans, ID photos, threat level control, and alarm notifications.
18. Support for the creation of unlimited customized monitoring layouts through the use of widgets, including layouts sized for the iPad or MacBook Air.
19. Graphic floorplans with active icons of security system resources.
20. System user permissions to grant whole or partial access to system resources, commands, and personal data.
21. Secure access to the user interface under encrypted password control.
22. Delivery of alerts via browsers, email, and text messages.
23. Remote Logging of system messages to remote host.
24. System health and maintenance:
   a. Provides the ability to manage system health alerts generated by the SMS when it detects error conditions at applicable health monitoring points.
   b. For a given system, the health monitoring points may include the system license, disks, RAID drives, FTP, NAS, Backup, Archive, Disk Usage, and VMS.
   c. If a user configures notifications for a selected email group, group members shall receive a message whenever an error condition is detected at a health monitoring point. If the user has chosen to include a health summary, each notification shall include status information for all of the system’s health monitoring points.

G. The SMS shall provide the following Video Management capabilities:
1. Real-time video monitoring displays, including multiple cameras simultaneously.
2. Pan, Tilt, and Zoom control of capable cameras.
3. Playback of video and access control event-related video.
4. Video switching and video widget pop-ups based on access activity or event activation.
5. Integrated alarm inputs from the Video Management System (VMS).
6. Digital playback of video events.
7. Linking of video and events based on triggers provided by the SMS or VMS.
8. Support for multiple DVR and NVR systems.
9. Multiple pre-programmed supported cameras.
10. Recall of photo ID and real-time video feed for video verification and comparison of card holder.
11. Monitoring and control through a web browser interface.
12. System user permissions to grant whole or partial access to system cameras and video resources.
13. Full integrated operation with S2 Magic Monitor® for live, recorded, forensic and life safety notification over existing TV's and Monitors.
14. Ability to use the SMS web interface to review the status of system and storage drives, and to adopt physical and virtual drives into S2 NetVR so it can begin using them for video storage.

H. The SMS shall provide the following Security Database capabilities:
1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
2. Partitions: It shall be possible to partition the system to create independent, virtual security management systems for multiple populations.
3. Support for the sharing of user privileges across partitions in a system.
4. Support for the grouping of multiple access levels across partitions in a system.
5. Built-in Open Database Connectivity (ODBC) compliant database for personal data.
6. LDAP, SLDAP, and Microsoft Active Directory integration for single-user logon authentication.
7. Microsoft Active Directory integration to allow the synchronization of cardholder data between Active Directory servers and the SMS.
8. Unlimited person records.
9. Network-secure API for external application integration.
10. Extensive and easy to use custom report generator.
11. User-defined data fields in personnel records.
12. Record recall by vehicle tag, name, or card.
13. An API for adding to, deleting from, and modifying the database.
14. Storage of system user passwords and permissions.
15. Storage and recall of ID photos and emergency personal information.
16. Pre-defined reports on system configuration, system activity history, and people.
17. A Used By feature for listing all correlations between specific card readers, keypads, inputs, and outputs, against groups, portals, elevators, access levels, access level groups, and other configured access control features. This feature may be useful for quickly determining I/O associations when editing and/or deleting system I/O points.
18. An Audit Trail report that shows changes made to the security database over a specified period of time.
   a. For each transaction listed in the report results, information is available on when the transaction occurred, who made the changes, the fields that were modified, and the original and new values.
   b. Search criteria can be applied to filter the report results, either by the person whose record was changed or by the area of the system configuration that was modified.
19. A Credential Audit report that shows all existing access cards by their current status settings and provides the ability to search for cards that have not been used for an operator-entered number of days. The report also shows for each card the name of the person to whom it was issued and the card number.
20. A Duty Log report shows duty log comments residing in the current security database, including archives.
   a. For each duty log comment included in the report results, information is available on when the comment was entered, who entered it, the date and time of the logged event associated with the comment, the name of the logged event, and the specific comment text.
   b. Search criteria can be applied to filter the report results, either by Operator (the user who entered the duty log comment) or by Event type.
21. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third party software (such as Crystal Reports) shall be necessary.
23. Selectable custom report output formats, including PDF, CSV, and HTML (default).
24. Custom report repository location. Users shall be able to review, cancel and delete reports from this data storage location.
25. Seamless search capability for access history reports. The reporting function shall search the database and archive simultaneously for matching report parameters.
26. Column sorting. Custom reports output shall be user configurable to sort individual columns in both ascending and descending order.
27. Periodic backup to on-board flash ROM and optional Network Attached Storage (NAS), or including FTP / SFTP servers.
28. Periodic archive creation for historical custom reporting and improved on-board database performance.
29. Email and text messaging (SMS) alert notifications.
30. Custom Menu capabilities allowing a user to create a custom menu containing a specific set of options, which can be assigned to users and will then appear in their navigation palettes.

2.03 HARDWARE REQUIREMENTS

A. The SMS shall employ a modular hardware concept that enables simple system expansion and utilizes a three-tiered hardware hierarchy:
   1. At the top tier is the Network controller, which shall contain the database engine, web server, application software, and configuration data. It is at this level that System Users, through a browser interface, shall interact with the SMS, set configurations, monitor activities, run reports, manage alarms, and manage cameras and video and storage.
   2. At the second tier is the Network Node, an intelligent device with native TCP/IP support, which shall make and manage access control decisions.
   3. At the third tier are the application extension blades. Each of these blades shall connect to and manage a set of inputs, outputs, readers, or temperature monitoring points.
   4. The Network Controllers and Network Nodes shall run on existing building TCP/IP networks and shall be configurable for access from separate subnets, through gateways and routers and from the Internet.
   5. An S2 MicroNode® Plus, which combines an Access Control blade and a Network Node, shall also be available.

B. The Network Controller shall contain the operating system, database engine, web server, application software, and configuration data. The Network Controller shall be available in four configurations to support small to medium, large, and ultra-large systems. Those systems shall be identified as a solid-state S2 NetBox Network Controller, a solid-state S2 NetBox Extreme Network Controller, an S2 NetBox Enterprise 50 Network Controller, and an S2 NetBox Enterprise 100 Network Controller.

C. The S2 Enterprise 100 Network Controller shall consist of a 1RU rack-mounted controller with additional processing power and memory, RAID-1 solid state disk drive array, serial port and network connections. The Exacta100 Network Controller shall have the following capabilities:
   1. OS Linux Ubuntu 16.04 LTS
   2. Storage 2 (128 GB) SSD’s configured RAID-1
   3. Processor Intel E3-1220v2 3.1 GHz 4 cores 4 threads
   4. Memory (RAM) 8GB
   5. Ethernet Ports 1
   6. Certifications/Compliances UL, CE, FCC Part 15, RoHS
   7. Warranty 2 years hardware, 1 year software
   8. Dimensions (H, W, D) 1.67in x 17.25in x 21.8in
   9. (4.24cm x 43.82cm x 55.37cm)
   10. Weight 18 lbs (8.17 kg)
   11. Operation Temperature 50° to 95° F (10° to 35° C)
   12. Storage Temperature -40° to 158° F (-40° to 70° C)
   13. Relative Humidity 5-90% non-condensing
   14. MTBF 172199
   15. AC Input 90 - 264 VRMS 47/63Hz 6/3 A
   16. BTU/h 1327
   17. Network Nodes / MicroNodes 512
   18. Access control portals 7168
   19. Access cards Unlimited
   20. Card formats 64 per Network Node (32 active)
   21. Concurrent system users 35
22. Alarm input points: 2000
23. Control point outputs: 2000
24. Temperature monitor points: 500
25. Elevators: 14 per Network Node
26. Floors: 52 per Network Node
27. Online event history log: Up to 400 million records
28. Ethernet switch ports: 1
29. Time specifications: 512 per Network Node
30. Time spec groups: 512 per Network Node
31. Time specs per group: 8
32. Threat Levels: 8 per Network Node
33. Threat Level Groups: 32 per Network Node
34. Holidays: 30 per Network Node
35. Access levels: 512 per Network Node
36. Access levels per person: 32 per Network Node
37. Unique user roles: Unlimited
38. Credentials per person: No limit per Network Node
39. Report Groups: 50
40. Camera Groups: 50

D. The S2 Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Controller and Application Blades connected to the system’s inputs, outputs, and readers. The Network Node shall be supplied with 120V AC at a minimum of 2.3 amps. The Network Node can optionally be powered by 12V DC at a minimum of 7Ah. Internal SLA battery backup shall supply sufficient power to provide for an orderly shutdown of the system in case of loss of external power. External battery backup shall be used to provide uninterrupted operation in the event of external power loss. Each Network Node shall support up to seven Application Blades. Communications between the Network Node and Network Controller shall be encrypted and authenticated using TLS digital certificates. Each Network Node shall have the following capabilities:

1. Application Blades: 7
2. Readers: 14
3. Reader Groups: 256
4. Access Levels: 512
5. Portals: 14
6. Portal Groups: 64
7. Supervised Inputs: 56
8. Input Groups: 64
9. Relay Outputs: 56
10. Output Groups: 64
11. Temperature Inputs: 56
12. Time specifications: 512
13. Time spec groups: 512
14. Time specs per group: 8
15. Threat Levels: 8
16. Threat Level Groups: 32
17. Holidays: 30
18. Access levels: 512
19. Access levels per person: 32
20. Credentials per person: Unlimited
21. Card formats: 64
22. Elevators: 14
23. Floors: 52
24. Floor Groups: 128
25. Time spec groups: 512
26. Credential Storage: Unlimited
27. Activity Log Records: 800,000
28. OS: Linux
29. Ethernet Ports: 1
30. Dimensions (H, W, D) Wall Mount: 17.0in x 15.0in x 6.75in
31. (43.18cm x 38.1cm x 17.15cm)
32. Dimensions (H, W, D) Rack Mount: 7.0in x 19.0in x 15.0in
33. (17.78cm x 48.26cm x 38.1cm)
34. Weight: 18 lbs (8.6 kg)
35. Operation Temperature: 32° to 95°F (0° to 35°C)
36. Storage Temperature: -4° to 158°F (-20° to 70°C)
37. Relative Humidity: 5-90% non-condensing
38. MTBF: 297,000
39. BTU/h: 184

E. The Application Blades shall interface with the Network Controller through the Network Node. The Application Blades shall be blade-style circuit cards. There shall be four types of Application Blades:

1. S2 Access Control Blade - The access control blade shall receive power via the ribbon cable bus directly from the Network Node blade. The access control blade shall supply up to 500 mA of power to one reader or 250 mA of power to each of two readers.
   a. Reader Connectors: 2
   b. Max Reader Cable Length: 500 feet (152m) (18 AWG twisted, shielded)
   c. Reader Power: 500 mA
   d. Input Connectors: 4
   e. Max Input Cable Length: 2000 feet (610m) (22 AWG twisted, shielded)
   f. Output Connectors: 4

2. S2 Input Blade - The input blade shall receive power via the ribbon cable bus directly from the Network Node blade. It shall support a wide variety of input supervision types including normally-open circuit and normally-closed circuits, and zero, one or two resistor configurations.
   a. Input Connectors: 8
   b. Max Input Cable Length: 2000 feet (610m) (22 AWG twisted, shielded)
   c. Supervision Types: 4 (open, closed, normal, alarm)

3. S2 Output Blade - The output blade shall receive power via the ribbon cable bus directly from the Network Node blade. Both normally-open circuit and normally-closed circuit output devices shall be supported. The relay outputs shall support any output devices that operate on the following maximum electrical ratings: 30 Volts DC or AC, 2.5 Amps inductive or 5.0 Amps non-inductive.
   a. Output Connectors: 8
   b. Contact Type: Form C
   c. Max Electrical Ratings: 30 Volts DC, 2.5 Amps
   d. Inductive, non-inductive:
   e. Max Electrical Ratings: 5.0 Amps

4. S2 Temperature Blade - The temperature blade shall receive power via the ribbon cable bus directly from the Network Node blade.
   a. Temperature Inputs: 8
   b. Max Temperature Cable Length: 1000 feet (305m) (18 AWG twisted, shielded)
   c. Temperature Range: 32° to 158°F (0° to 70°C)

F. Each S2 MicroNode Plus shall function as a node and as an access control blade. In addition, each S2 MicroNode Plus shall support one temperature input. The S2 MicroNode Plus may be
supplied with 12VDC at 5 amps. With a 12VDC 5A power supply the total power available for all external output is 2000mA (24 watts). Alternatively, it shall also be possible to power the S2 MicroNode Plus from PoE switch that conforms to the IEEE 802.3af standard, or from PoE Plus switch which conforms to the IEEE 802.3at standard. With PoE (802.3af) as the power source the total power available for all external 12V output is 500mA (6 watts @12VDC). With PoE Plus (802.3at) as the power source the total power available for all external 12V output is 1000mA (12 watts @12VDC).

1. Access Control Readers 2
2. Access Levels 512
3. Portals 2
4. Portal Groups 64
5. Reader Groups 256
6. Supervised Inputs 4
7. Input Groups 64
8. Relay Outputs 4
9. Output Groups 64
10. Temperature Inputs 1
11. Elevators 2
12. Floors 4
13. Floor Groups 128
14. Time spec groups 64
15. Credential storage 150,000
16. Activity Log records 800,000
17. Max Reader Cable Length 500 feet (152 m) (18 AWG twisted, shielded)
18. Input Connectors 4
19. Max Input Cable Length 2000 feet (610 m) (22 AWG twisted, shielded)
20. Output Connectors 4; 2 wet / dry selectable
21. Temperature Inputs 1
22. Max Temperature Cable Length 1000 feet (305 m) (18 AWG twisted, shielded)
23. OS Linux
24. Ethernet Ports 1
25. MBTF 297,000
26. Dimensions (H, W, D) 11.34in x 8.0in x 2.57in
27. (28.77cm x 20.32cm x 6.53cm)
28. Weight 3.2 lbs (1.45 kg)
29. Operation Temperature 32° to 95° F (10° to 35° C)
30. Storage Temperature -40° to 158° F (-40° to 70° C)
31. Relative Humidity 90% non-condensing
32. MTBF 297,000
33. Btu/h 204

G. All wall-mount enclosures shall have a lock requiring a key, and a cabinet door tamper switch.

2.04 SOFTWARE REQUIREMENTS

A. Operating System and Application Software:
1. The embedded operating system for the SMS is Linux Ubuntu 16.04 LTS (long term support) as the operating platform. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.
2. The SMS application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.
3. The SMS shall support the following web browsers:
   a. Internet Explorer 11
   b. Chrome 70
   c. Firefox 63
d. Safari 8, 9

B. S2 Software Licensing:
   1. Software licensing shall be based upon the number of portals, cameras, and select features for one Network Controller. Software license upgrades shall be available if system portal and camera capacity must be increased. The S2 user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.
   2. Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more portals you will need a new Product Key. The Activation Key contains the software support expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the About page.

C. Software upgrades shall be possible from a browser on any network-connected PC by uploading a software update to the Network Controller. The Network Controller shall automatically upgrade all connected Network Nodes. No client software installation shall be necessary.

D. Online Help and Documentation - The SMS shall be provided with complete embedded documentation. The online documentation shall include:
   1. Context-sensitive online Help - (The Help displayed is specifically relevant to the current screen.) The online Help system shall provide explanations and procedures for all monitoring, administrative, and system configuration and maintenance functions. The Help system shall have linked table of contents, a linked index, and frequently asked questions pages. Each topic shall also have links to related topics. Each Help topic shall be printable.
   2. Technical Support Notes - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
   3. Installation Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
   4. Video Integration Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
   5. End-User Task Guide - This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

E. S2 Support Collaboration - It shall be possible, by the use of a network Support Collaboration Tool, for a technical support specialist to connect to the SMS and assist on-site technicians from remote network-connected locations. It shall only be possible for an on-site system administrator or technician to initiate this connection. There shall be no way to initiate this connection from outside of the secure network.

F. Language Support - The SMS shall be provided with multiple language support. The ability to switch from one language to another shall be accomplished through the user interface. Translation of the user interface, online help and documentation into other languages shall be available. The languages supported shall include:
   1. English
   2. Spanish
   3. Portuguese
   4. French
   5. Italian
   6. Thai
   7. Chinese Traditional
   8. Chinese Simplified
   9. Japanese

G. Date Formats - The SMS shall support global date formats as follows:
   1. mm/dd/yyyy
   2. dd/mm/yyyy
3. yyyy/mm/dd

H. Floorplans - The SMS shall provide graphic floorplan capability including graphic display of links to other floorplans, alarms and system resources such as portals, IP video cameras, inputs, outputs, and temperature monitoring points.
   1. The Network Administrator holding at least a Setup user role shall be able to graphically configure device icons onto the floorplan images, and to upload additional floorplan images. JPEG images shall be supported, and the maximum size for a floorplan image shall be 256K.
   2. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

I. Personnel Data - The SMS shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.
   1. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.
   2. A system user holding at least an Administrator user role shall be able to create, delete, and modify person records, including access levels and access level groups.
   3. A system user holding at least a Setup user role shall be able to configure the display of person records. For example, the user shall be able to hide various tabs, and configure the User-defined tab by changing the tab label and customizing any of the 20 data fields that appear on the tab. The user shall be able to enter text, numbers, Boolean expressions, or user-defined list information into these data fields. The user shall also be able to define UDF value lists, which can be displayed as pre-entered drop-down lists for user-defined data fields.
   4. The Person page shall contain a Journal tab, allowing the operator to enter and save a journal entry associated with the person.

J. Browser Based Data Import and Export - A Data Operations Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating and ongoing populating, of cardholders into the SMS database. Data that shall be importable and exportable shall include:
   1. Controller
   2. Partition
   3. FirstName
   4. LastName
   5. MiddleName
   6. Deleted
   7. Credentials [list]
      a. HotStampNum
      b. EncodedNum
      c. CardFormat
      d. Status
      e. ExpirationDate
      f. RemoteLockUserType
      g. Profile
   8. AccessLevels [list]
      a. AccessLevelName
      b. ActivationDate
      c. ExpirationDate
      d. AutoRemove
   9. PersonID
   10. PIN
   11. ExemptFromPin
   12. UDF1-20
13. Notes
14. ActivationDate
15. ExpirationDate
16. BadgeLayout
17. PictureFile
18. Phone
19. Email
20. Email2
21. Location
22. OtherContactName
23. OtherContactPhone1
24. OtherContactPhone2
25. Vehicles [list]
a. Color
b. Make
c. Model
d. State
e. Licnum
f. Tagnum
26. AntiPassBackPriv
27. ExemptFromNonUse
28. TracePerson
29. UseExtendedUnlock
30. LoginUserName
31. LoginUserPassword
32. LoginUserRole
33. LastModDateTime
34. LastModUser

K. Data Security:
1. Administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.
2. In addition, it shall be possible to enable secure communications between the Network Controller and web browsers, and between the Network Controller and Network Nodes.
3. Communication between the Network Controller and browsers shall be secured using TLS digital certificates. The available options are:
   a. Generate a self-signed certificate that is signed with your web server’s own private key. This certificate shall provide encryption but not authentication.
   b. Upload a certificate that is signed by a certificate authority (CA) to the Network Controller. This certificate shall provide both encryption and authentication.
   c. Upload your organization’s own certificate and matching key to the Network Controller.
4. Communication between the Network Controller and the S2 M1-3200 Network Nodes shall be encrypted and authentication/tamper detection shall be done using TLS digital certificates. Authentication will occur when the Network Node connects to the Network Controller. The available options are:
   a. Use a default self-signed certificate. The default built-in certificate for Network Node communication shall use 2048-bit RSA key with SHA1 signature. The cipher mode to encrypt the data shall be AES256-GCM with SHA384 hash function.
   b. Generate your own self-signed certificate, which is signed by your web server’s own private key. This certificate shall provide encryption but not authentication.
   c. Upload a certificate that is signed by a certificate authority (CA) to the Network Controller. This certificate shall provide both encryption and authentication.
   d. Upload your organization’s own SSL certificate and matching key to the Network Controller.
5. Communication between the Network Controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.

L. Data Backups - It shall be possible to configure regular automatic database backups.
   1. It shall be possible to back up a solid-state S2 NetBox Network Controller or S2 NetBox Extreme Network Controller to a built-in solid state hard drive.
   2. It shall be possible to back up an S2 Enterprise 50 or S2 Enterprise 100 Network Controller to a built-in solid state hard drive.
   3. It shall be possible to save backups from any Network Controller to separate network attached storage (NAS) and file transfer protocol (FTP or SFTP) servers.
   4. It shall also be possible to setup regular automatic creation of database archive files.

M. On-board Data Management - Each night the SMS shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.

N. Partitions - It shall be possible to create multiple partitions for the management of multiple security systems or multiple populations.
   1. It shall be possible to limit access to the data and resources of one partition to those with permissions for that partition.
   2. It shall be possible for each partition to have its own population, resources, rules, events, video management, log data, reports and network resources.
   3. It shall be possible to grant Monitor, Administrator and Setup privileges for multiple partitions to the same user. It shall also be possible to create custom user roles for each partition.
   4. A Network Node can reside in only one partition. It shall be possible to create partitions without Network Nodes.

O. User Roles and Permissions - There shall be four pre-programmed levels of user roles, and custom user roles can be configured in the system with different permissions for each user:
   1. Master Partition Monitor - These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the Activity Log, cameras, and floorplans.
   2. Master Partition Administrator - These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the enrollment database, issuing and revoking cards, generating reports, and performing database backups.
   3. Master Partition Setup - These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default) partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floorplan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings; performance of system maintenance such as database backup and restore, software updates and file cleanups; designation of time zone, daily backup schedule and enrollment readers.
   4. Full System Setup - These users may use the functions of all menus in all partitions.
   5. Custom User Roles - In addition to the roles above the system shall also support the creation of detailed user permissions regarding which data operations, cameras, floorplans, elevators, events, access levels, access level groups, portals, reports, and personal data fields the system user may see, edit, delete, or control.

P. Alarm Panels - The SMS shall interface with alarm panels via wiring to an input point and an output point on each panel. This provides the ability to arm and disarm the panels, and to trigger events based upon alarm panel status.

Q. Intrusion Panels - The SMS shall integrate with the following intrusion panels:
   1. BOSCH B and G Series control panels running with firmware version 3.03.014 or later.
2. Digital Monitoring Products (DMP) XR150, XR500 and XR550 Command Processor Panels.

3. Security administrators can use events on an intrusion panel, such as a zone going into an alarm state, to trigger events in the SMS. They can also use events in the SMS to control operations on an intrusion panel, such as the arming or disarming of an area.

4. Monitors can use the Intrusion Panel widget to view configuration and status information for an intrusion panel. They can also arm and disarm areas, bypass and reset zones, and activate and deactivate outputs associated with the panel.

5. The intrusion panels shall communicate their status to the system using port 6000-6063 (DMP), or port 7700 (BOSCH).

6. Intrusion panel system messages shall identify the panel that generated the message.

7. The system shall support at least 200 DMP panels and at least 255 BOSCH panels.

8. For DMP panels only: The system shall assign precedence to arm/disarm commands sent from the UI to the DMP panels.

9. Communication errors between DMP panels and the SMS shall be retried after one minute. Communication errors between BOSCH panels and the SMS shall be retried after two minutes, but this default retry time is configurable.

R. Alarm Events - The SMS shall manage alarm events.

1. It shall be possible to delay an input's change to the Alarm state by a specified number of seconds. The range of delay options shall be 0.5 seconds or from 1 to 120 seconds.

2. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:
   a. Lock and Unlock portals.
   b. Activate and Deactivate relay outputs.
   c. Arm and Disarm input groups.
   d. Pulse outputs or output groups.
   e. Arm and Disarm alarm panels.
   f. Send emails and SMS messages.
   g. Move cameras to preset positions.
   h. Switch to a video monitor.
   i. Record video.
   j. Momentarily unlock portals.
   k. Change the threat level for a location, and (optionally) for its sub-locations.
   l. Make entries in the Activity Log.
   m. Play a digital sound file; it shall be possible to specify that it play in a loop until cleared or acknowledged.
   n. Display alarms in different colors.
   o. Set a priority for an alarm (one of 20 levels, with 1 being the highest).
   p. Require a duty log entry.
   q. Clear an alarm automatically or require an acknowledgement.
   r. Push a Magic View to an S2 Magic Monitor.
   s. Push a Magic View to a group of S2 Magic Monitors.
   u. Push an S2 NetVR camera stream to a group of S2 Magic Monitors.

3. A system user holding at least a Setup user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.

4. It shall be possible to trigger events based on system activity such as:
   a. Failed login attempts.
   b. Video motion detection.
   c. Camera failure and camera restore events.
   d. Valid or Invalid card reads.
   e. Portals held or forced open.
   f. Valid card reads with a specified access level.
   g. Inputs entering an alarm state.
h. High and low temperature events.

i. Low battery voltage and low battery capacity events.

j. Alarm panel arming failures.

k. Alarm panel zone faults.

l. Tailgating and passback violations.

m. Occupancy limit exceeded

n. Region empty violations.

o. Network Node power failure, communication failure, timeout, and tamper events.

5. It shall be possible to clone an event which creates an event with all attributes of the original, needing to change only the event’s name and any attributes it will not have in common.

S. Activity Monitoring:

1. The SMS shall support a Monitoring Desktop that integrates video, system Activity Logs, floorplans, threat level control, ID photos, and alarm notifications.

2. Activity Log viewing includes one-click navigation to person records.

3. The system shall support a Widget Desktop that allows the creation of custom monitoring layouts. Within a custom layout, widgets display live video, system Activity Logs, alarm notifications, ID photos, floorplans, duty log entries, portal status displays, and intrusion panels.

4. The system shall support specific alarm events in the Events and Alarm Workflow widgets in one of the following three modes:

   a. Activations do not display alarms - No alarm events shall be displayed in either widget when such events are configured in this mode. All settings shall be disabled in the Acknowledgements section of the page.

   b. Multiple activations display a single alarm - Alarm events shall appear in both widgets each time the alarm input is triggered. Each subsequent trigger of the same input shall display a new alarm event which shall replace the previous one.

   c. Multiple activations display multiple alarms - Alarm events shall appear in the Events widget as described in item b above. The Alarm Workflow widget shall simultaneously display a separate alarm event for each alarm trigger.

5. Many widgets support multiple partition viewing and filtering. For example, the Activity Log widget can display data from multiple partitions and data filtered by event type or reader group, and/or based on the text content of the event. Additionally, the system shall support the use of category filters, including Access Control, Alarms and Events, Threat Levels, System Admin, Devices, Network Nodes, Access Granted, and Access Denied.

6. It shall also be possible to view cameras, Activity Logs, and floorplans on separate monitoring pages within the application.

7. The system shall support tracing a person’s activity in the current partition if the “Trace this person” check box is selected in the person record.

   a. The traced activity is displayed in bold in the color selected for “Trace person log color” on the Network Controller page.

   b. In addition, if an event is selected for “Trace person event” on the Network Controller page, the event is triggered each time a traced person makes an access attempt. These event activations can be reported using a Trace people filter in a custom history report.

   c. When a user opens a person record in which “Trace this person” is enabled, a dialog box shall indicate that the person’s activity is being traced.

8. The Activity Log shall be capable of displaying additional cardholder information, including “Hot Stamp”, “Encoded Number”, and “Company ID”.

9. The system shall include a Photo Display Widget, which allows operators to display a current ID photo based on the most recent access request.

10. It shall be possible for a system user to place restrictions on the retention and tracking of access activity by setting options on the Network Controller page.

    a. The user can set an option to show Access Granted events in the Activity Log only when both a credential and PIN are used for access.
b. The user can set an option to have the system retain Access Granted and Access Denied events only for a specific number of days. Once an Access activity record has been stored for the specified number of days, it shall be purged from the database. Access activity records shall not be included in archives.

T. Network-based Cameras and Video Surveillance - The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system’s video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.

1. Presets - The system shall support the creation, deletion, and editing of camera preset positions in the system. It shall also be possible to save changes in preset positions directly to a camera.
2. Views - The system shall support the creation, deletion, and editing of multiple camera views, specifically Quad views (four cameras), S2 NetVR 2x2 view and S2 NetVR 1+7 views. The application shall provide a drop-down pick list for selecting current views or naming of new views.

U. Access Control:

1. The SMS shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.
2. Time Specifications: Each time specification must be assigned a unique alphanumeric name of up to 64 characters. The definition of a time specification shall require the assignment of both a start time and an end time.
   a. Each day of the week shall be individually assignable for inclusion in time specifications.
   b. Up to eight holiday groups per partition shall be assignable for inclusion in time specifications. If no holidays are assigned to a time specification then no holiday access shall be allowed. It shall be possible for users to change the default holiday group names (hol1 through hol8) to more meaningful names.
   c. Time specifications shall be assignable to access levels, output groups, portal groups, input groups, and alarm events.
   d. Time specifications shall function appropriately per Network Node for the time zone specified for that Network Node.
3. Card Formats - The system shall support the use of readers that use the Wiegand Reader Interface. The system shall support but not require the use of the card facility code. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.
   a. It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, and designate parity bits. The system shall support up to 64 different card formats, and 32 formats can be enabled at a time. With compatible Mercury boards the system shall allow for up to 16 card formats to be designated as Mercury-supported. These Mercury-supported formats will be enabled on Mercury panels.
   b. It shall be possible to reverse the read order of the bits in the facility code and/or card ID portions of a card format.
   c. It shall be possible to view and change the default parity bit definitions for a card format.
   d. A card formats shall be disabled by default. Once enabled, the format appears in the card format dropdown within the credential section of a person record.
   e. The system shall support the use of a concatenated version of the FIPS 201 format (Federal Information Processing Standard Publication 201)
   f. FIPS 201 128-bit format. This system-owned credential format is based on Federal Information Processing Standard (FIPS) 201. It can be enabled and disabled, but it cannot be modified. The credential number is a Federal Agency Smart
Credential-Number (FASC-N) containing 32 characters, encoded as binary-coded decimal (BCD) digits. When issuing a credential using this format, a user can either enroll the credential via an enrollment reader or use a dialog box to enter a value for each of the fields that make up the 32 BCD string.

g. Administrators shall be able to specify a specific number of days of non-use that will be allowed before unused cards will be disabled. Administrators shall be able to exempt individual users from this non-use rule.

h. The system shall support the Southwest Texas Regional Advisory Council (STRAC) UUID format of 128 bits displayed as 32 hexadecimal characters.

4. Access Levels - The system shall be capable of storing unlimited access levels in each partition.
   a. Each access level must be assigned a unique alphanumeric name of up to 64 characters.
   b. The definition of an access level shall require the assignment of a reader or reader group, and a time specification.
   c. It shall be possible to also assign an elevator floor group to an access level.
   d. It shall be possible to create a temporary access level by assigning an activation date and/or expiration date for any of a person's assigned access levels. It shall also be possible to have the system automatically remove a temporary access level once it has expired.

5. Access Level Groups - The system shall support the creation of access level groups, which will allow users to assign multiple access levels at once. Users with at least a Setup user role can create single-partition access level groups that can be viewed and assigned within the partition in which they were created. Users with the Full System Setup role can also create multi-partition access level groups, which can be viewed and assigned across partitions, and can contain access levels from multiple partitions, depending on the user's permissions.

6. First-in Unlock Rule: The system shall support the use of a First-in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs.
   a. The First-in unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the rule is satisfied and the unlock time spec is valid.
   b. There can be up to 64 First-in unlock rules in the system at a time.

7. Double Card Presentation - The system shall support the use of a Double Card Presentation mode. This mode shall allow the presentation of a card twice in quick succession at a designated reader. Such a "double read" shall change the locked portal to an unlocked state until a subsequent relock event or user-designated timeout occurs. The double card presentation mode shall be enabled on an individual portal basis and shall also require a designation on the access level assigned to the cardholder. The mode shall adhere to time spec and threat level restrictions.

8. Keypad timed unlock - It shall be possible to enable a timed unlock feature for a portal that has a combination reader/keypad device. Once this feature is enabled, any cardholder with valid access to the portal shall be able to specify how long the portal will remain unlocked.
   a. A cardholder presents his or her card and then enters the associated PIN, followed by the number sign (#) and the number of minutes (1-99) the portal should remain unlocked.
   b. The portal will remain unlocked for the specified number of minutes; unless it is closed before the timer expires. If the portal remains open after the timer has expired, a [Door Held Open] alarm will be activated.
   c. If reader/keypad devices are located on both sides of the portal, cardholders will be able to use either device to initiate a timed unlock.

9. Keypad Commands - For Network Node connected access control keypads and combination card reader/keypads, users having the authorized access levels shall be capable of executing keypad initiated commands based on pre-defined two-digit number codes.
a. Keypad commands shall be defined by mapping one or more two-digit codes to events defined in the system using the “Setup: Alarms: Keypad Commands” page.
b. Keypad commands shall be assigned to specific keypads using the “Setup: Access Control: Readers/Keypads” page.
c. Keypad commands shall be assigned to specific access levels using the “Setup: Access Control: Access Levels” page.

10. Holidays - The system shall support up to 30 holidays per Network Node. Each holiday must be assigned a unique alphanumeric name of up to 64 characters. The definition of a holiday shall require a start date and an end date. Holidays shall have the ability to span several days using only one holiday slot. Holiday definitions shall support the designation of a start time and an end time. If no start time is designated then the system shall default to 00:00 (start-of-day). If no end time is designated then the system shall default to 24:00 (end-of-day). Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.

11. Portals - A portal is a configurable object which can contain a reader or two readers, with or without keypads; a door status monitor (DSM); a request to exit (REX) device; and a lock. A system user with at least the Setup role shall be able to view current portal definitions, change portal definitions, delete portals, and create new portals. Creating a portal defines the access and alarm behavior of the access point. This can include:
a. Card readers and keypads.
b. Output for locking.
c. Input for monitoring the door switch.
d. Input for a Request-to-Exit function.
e. Local alarm outputs and system alarm events.

12. Portal Groups - It shall be possible to create groups of portals and to assign an unlock time specification to the entire group. All the portals in the group shall remain unlocked during the time specified.
a. It shall be possible to use portal groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a portal group is assigned to a system user then the portals in that group shall be viewable and unlockable by that system user.

13. Portal Alarm Conditions - Depending on the device type, system-wide events can be configured for up to seven portal alarm conditions. The seven alarm conditions are as follows:
a. Forced: When a portal is opened and there has been no card read, nor request to exit.
b. Held: When a portal is held open past the expiration of the shunt timer.
c. Invalid: When the portal reader reads a card for which there is no entry in the database.
d. Valid: When the portal reader reads a card for which there is a valid entry in the database.
e. Duress: A card has been presented to the reader, followed by an entry of the cardholder’s duress PIN into the keypad.
f. Double Card Presentation: For a portal with Double Card Presentation enabled, a qualified user has performed a double read to unlock the portal.
g. Unlock: The state of the portal’s RU (Remote Undog) exit device has changed from DNE (Dog On Next Exit) to Dogged (unsecured).

14. Two-man entry restriction: It shall be possible to require two valid card reads by different cardholders within a specified number of seconds for entry to a specific portal.

15. Escort Rule - The system shall support escorted access control rules by assigning one of the following two escort types to each cardholder:
a. Escort - Cardholders with this access level shall enable access for persons requiring escorted access by presenting their credential at a card reader within 15 seconds after those requiring escorted access.
b. Requires Escort - Cardholders with this access level shall be unable to access the portal unless a valid “Escort” cardholder presents their credential at the card reader.
within fifteen seconds after the “Requires Escort” credential has been presented. Otherwise, access will be denied and the Activity Log shall display a message with the reason code NO ESCORT.

16. With compatible Mercury boards, the system shall support Facility Code Mode for reader/keypads, with the following available options.
   a. None (the default): The facility code is treated as part of the overall encoded credential number. A card matching only the facility code will not be granted access.
   b. Configuration: Facility-code only checking is turned on only while the complete set of credentials is being downloaded to the Mercury panel. Once the credential download is complete, the behavior is the same as for the “None” setting.
   c. Offline: Facility-code only checking is turned on only when the SIO is disconnected from its Mercury panel (via the RS-485 link). When the SIO is connected to the panel, the behavior is the same as for the “None” setting.
   d. Configuration and Offline: Facility-code only checking is turned on both during the credential download and when the SIO is disconnected from its Mercury panel. At all other times, the behavior is the same as for the “None” setting.
   e. Permanent: Facility-code only checking is always turned on.

17. Anti-passback - The system shall support both regional and timed anti-passback access control. For anti-passback functions, it shall be possible to configure regions, assign readers to those regions, and specify events for response to tailgate, passback, and occupancy limit violations. It shall also be possible to designate parent regions for hierarchical anti-passback.
   a. Grace: It shall be possible for a system Monitor or Administrator to Grace Card holders from passback and tailgate violations.
   b. It shall also be possible to set a specific time for all cardholders to be graced daily.
   c. The system shall be able to automatically place the cardholder in a predefined region upon the selection of the grace option.

18. Mustering - To aid in evacuation management it shall be possible to designate a region or regions for mustering. It shall be possible to quickly get an occupancy count and occupant list for any region.

19. Scheduled Actions - It shall be possible to specify system actions to occur at scheduled times. When scheduling an action, it shall be possible to specify whether the time specifications for the scheduled action will be based on the time zone set for the local Network Node or the time zone set for the Network Controller. Scheduled actions can include:
   a. Arming and disarming inputs and input groups.
   b. Activating and deactivating outputs and output groups.
   c. Locking and unlocking portals and portal groups.
   d. Locking and unlocking elevator floors and floor groups.

20. Floor plans - The system shall support displaying of active graphic floorplans and configuring each floorplan with icons representing system resources: cameras, portals, temperature points, and alarms. A network administrator holding at least a Setup user role shall be able to upload floorplan images and graphically configure device icons onto the floorplan images. Viewing floorplans will require the Adobe Flash Player plug-in for the browser.
   a. It shall be possible to create floorplan groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a floorplan group is assigned to a system user then the floorplans in that group shall be viewable by that system user.

21. Elevator Control - The system shall be capable of controlling elevator access to floors. The system shall control up to 52 floor buttons per Network Node, or up to 28 floors with floor selection tracking. With compatible Mercury boards, the system shall control up to 128 floor buttons per elevator cab, with or without floor selection tracking.
a. It shall be possible to create, change, or delete floor groups, and to assign a free access time specification to a floor group. The floors in this group will be freely accessible during the times defined by the chosen time specification.

b. It shall be possible to create elevator groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If an elevator group is assigned to a system user then the elevators in that group shall be viewable by that system user.

c. Users assigned to custom user roles for one or more elevator groups may be given Free Access privileges to manage access to the elevators in those groups by using the Scheduled Actions page or an Elevator Status widget to:
   1) Momentarily enable free access for an elevator floor button. This will allow persons to temporarily access one or more floors without the need for an access control transaction such as a card read.
   2) Schedule an extended period of free access to one or more floors. This will allow persons to access the floors without constraints for the duration of the free access schedule.

d. Floor Tracking - Users may configure optional inputs on the SMS that shall change state when a corresponding floor selection button on an elevator is pushed, enabling the system to monitor the status of each floor selection button in relation to specific access credential transactions.

e. The system shall support Elevator Floor Tracking
   1) The system shall support optional inputs that change state when the corresponding floor-select buttons are pushed, allowing the system to detect each button’s status.
   2) The system shall support an optional input that will change state and trigger an event, when the elevator’s duress/emergency button is pushed.

f. Users may configure an optional input for each elevator and corresponding event on the SMS when the elevator’s duress/emergency button is pressed.

V. Threat Levels:
1. It shall be possible to configure up to eight threat levels per partition. It shall be possible to alter security system behavior using threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.
2. The SMS shall support 32 threat level groups.
3. It shall also be possible to change the system threat level in response to an alarm event.
4. The current system threat level shall display in the title bar of the security application interface and on floorplans.

W. Location-based threat levels - The system administrator shall have the ability to define locations. This allows for threat levels to be assigned to individual locations.
1. Within each parent location, sub-locations can be created, and additional sub-locations can be created within each of these, and so on. This creates a location hierarchy.
2. Locations shall contain portals.
3. Threat levels can be applied to any location within the hierarchy.

X. Appropriate Use banner - The system administrator shall have the ability to enter text (such as an appropriate use statement) to be displayed on the login page.

Y. Reports:
1. The SMS shall support a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
2. It shall also be possible to produce reports directly from the Network Controller based on data in archive files on FTP or SFTP servers, network attached storage, or the built-in hard drive.
3. The SMS shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse.
Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.

4. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

5. The system shall be capable of sorting users by various criteria, including email address, and allow for email groups to be selected for auto-distribution.

6. Report generation shall not affect the real-time operation of the system.

7. The specific reports provided shall include the following:
   a. Configuration Reports
      1) As Built - A graphical report that displays an image of each Application Blade in a Network Node and the specific resources (inputs, outputs, readers, etc.) configured for that blade. The network settings for the Network Node shall also be included. This report shall display an image of each Mercury panel being used and specific resources configured on those panels.
      2) Cameras - Displays all camera configuration information including control address, IP port, and camera type.
      3) Camera Presets - Displays configured presets for each camera in the system.
      4) Elevators - Displays elevator configuration information including Network Node, reader, floor to output mappings, floor select, and duress/emergency inputs.
      5) Floor Groups - Displays all configured floor groups for use in elevator control.
      6) Holidays - Displays holiday specification information.
      7) Portals - Displays portal definition information including reader, DSM input, REX input, alarm outputs, and events.
      8) Portal Groups - Displays a list of all defined portal groups.
      9) Reader Groups - Displays defined groups of readers.
     10) Remote Locksets - Available if the Remote Locksets feature is licensed for the system. Displays the following information for each remote lockset: name, IP address, synchronization status, serial number, last completed update time, firmware version, battery voltage, assigned remote lockset profile, and number of stored cardholders. The report can be sorted by any of the columns.
     11) Resources - Displays all configured system resources including readers, inputs, outputs, elevators, and temperature points.
     12) Threat Level Groups - Displays all configured threat level groups and the threat levels assigned to them.
     13) Threat Levels - Displays all configured threat levels including the description and color assignment.
     14) Time Specs - Displays all configured time specs currently in the system. Time specs, which define allowed access times, are used as part of access level definitions.
   b. History Reports
      1) Access History - Displays access history based on an entered query. The system user can specify the query using either the keyboard or point-and-click selection. Access history reports shall include the ability to include elevator access requests.
      2) Alarm Resolution - Provides a report that tracks alarm duration. This is the period between the activation of an alarm and its resolution. Alarms are individual activations of events defined in the system. For an alarm to be resolved, it must be acknowledged (if acknowledgement is required according to the associated event definition) and its underlying cause must be cleared.
      3) Custom Report - Provides the capability to create custom reports of historical data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Custom report output shall be user selectable for HTML, PDF or CSV format. Custom report configuration shall include page size,
orientation, and column width and shall automatically notify the user if the selected configuration exceeds the selected page size.

4) General Event History - Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.

5) Portal Access Count - Display how many times users have used a portal.

6) Audit Trail - Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.

7) Duty Log - Displays duty log comments residing in the current security database, including archives. For each duty log comment, the report shows the date and time the comment was entered, the person who entered the comment, the date and time of the logged event associated with the comment, and the Activity Log message followed by the specific comment text.

c. People Reports

1) Access Levels - Displays all access levels entered into the system including time specification, reader/reader group, and floor group.

2) Credential Audit - Lists existing credentials by their status settings (such as Active, Damaged, Lost, or Not Used). Before running the report, users can filter the data to see only credentials with a status setting, or only credentials that were not used with a specific number of days from the date they were issued.

3) Current Users - Displays a list of all security system users currently logged in to the security system website.

4) Custom Report - This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Custom report output shall be user selectable for HTML, PDF or CSV format. Custom report configuration shall include page size, orientation, column width, and shall automatically notify the user if the selected configuration exceeds the selected page size.

5) Occupancy - Displays a list of defined regions with the number of people currently occupying each region and the maximum number of occupants allowed, if a maximum has been specified.

6) Photo ID Gallery - Displays all the photo ID pictures in the system and the person’s name.

7) Photo ID Requests - Displays all outstanding badge print requests and lists ID, name, badge layout, activation date, request date.

8) Portal Access - Lists people with access for a selected portal.

9) Roll Call - Allows you to select a defined Region from the drop-down and see a list of people currently in that region.

10) Roster - Displays every person entered into the system and it lists name, ID photo, expiration date, username, and access level.

Z. Administration - The SMS shall provide for the performance of system administration tasks from any network-connected computer with a browser. Most of the administrative, maintenance, and configuration utilities and functions shall require a SMS user with at least a Setup user role. Information from the network administrator shall, in many cases, also be required. These administrative tasks shall include but not be limited to:

1. Generating reports:
   a. The system shall support a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
   b. Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data
input at report runtime. Report results can be printed, output to a pdf file or put into a spreadsheet.

c. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

d. A system user holding All Administration permissions, or permissions to view and edit specific types of reports, shall be able to view and create reports.

2. Database backups:
   a. The system shall create database, or full system data backups, each night at 00:15 hours. These backups shall be stored in ROM and written to the drive on the disk-based controller.
   b. It shall also be possible for system users to create such database backups at any time. Any database backups onboard the Network Controller may also be downloaded to off controller storage by the system user at any time.
   c. Backups shall also be written to network attached storage (NAS), or to an FTP or SFTP server if such storage has been configured in the system.
   d. A user with at least a Setup user role shall have the ability to schedule a time for the daily transfer of backups to NAS. The user can specify that the transfer will occur after the daily backup or at a specific time of day.

3. System restore:
   a. The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the Network Controller. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.
   b. It shall be possible to review backups by date and description and select the desired backup for upload to the Network Controller or restoration as the current system database.

4. Software updates:
   a. Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these .upg files. Update of the application software shall only be possible from an update file onboard the Network Controller. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.
   b. Software updates may involve the Network Controller only or may include updates for the Network Node(s) also. The monitoring of the security system may be unavailable for several minutes during this process.

5. File upload - The system shall support uploads of files for use in and with the system. Supported files include:
   a. Floorplans in .jpg format
   b. Badge layouts
   c. ID photos in .jpg format
   d. Database backups
   e. Software license files
   f. Software updates
   g. Threat level icons in .jpg format
   h. Sound files (.wav) for use in event alerts

6. Setting system time, time zones, and time servers:
   a. The SMS shall support the setting of time zones by selection of a drop-down pick list. Time zones shall be separately settable for the Network Controller and for each S2 M1-3200 Network Node, S2 MicroNode Plus, or Mercury panel in the system. An extensive list of world-wide time zones shall be provided. Adjustments for daylight saving time (summer time) shall be automatic.
   b. The SMS shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and
its Network Nodes are regularly synchronized with the exact time used by all other network resources.

c. It shall also be possible to manually set the system date and time.

7. Changing passwords:
   a. Person data maintained in the system may also contain a user name and password for logging on to the security application website as a system user. The system shall support the changing of administrator passwords. It shall be required to enter the password twice for verification purposes.
   b. Administrators shall be able to specify a minimum number of characters that users must include in their login passwords.
   c. Administrators shall be able to specify that users’ login passwords must contain a combination of letters, numbers, and special characters.
   d. Administrators shall be able to set a password expiration period in months (from 1 month to 12 months) for all passwords in the current partition. Whenever a user changes his or her password, it will remain in effect for the selected number of months.
   e. It shall also be possible to integrate an LDAP or SLDAP server for single-user logon authentication. This will reference the LDAP-stored password for use by the system.

8. Issuing and revoking cards (credentials):
   a. Access cards shall be assignable by the system user either by entering card data directly into the person record or by use of an enrollment reader. Access levels shall be assignable through the user interface by selection from the list.
   b. Access cards shall be revocable at any time. A system user holding at least an Administrator user role may perform this action. Revoked cards shall stop functioning immediately.
   c. A system user holding at least the Administrator role may also disable an access card by changing its Active status to Clear, Damaged, Disabled, Expired, Forgotten, Lost, Missing Active, Missing Disabled, Not Returned, Not Used Not Validated, Returned, Stolen, Suspended or Temporary Expired. The card will not function with any of these status settings (unless the setting has been customized, as described below). Running a Credential Audit report shall allow existing cards to be viewed by their status settings.
   d. A system user holding at least the Administrator role may customize any of the following access card status settings: Clear, Damaged, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen, Suspended or Temporary Expired. The user can change the name and/or description of the status setting, and can specify that a card to which the setting is applied will continue to function.
   e. A maximum number of active cards per person can be enabled for the system. Once a person has reached the system limit, a new card can be added for that person only if one of his or her active cards is revoked or disabled.
   f. When “Enable credential profiles” is selected on the Network Controller page, it shall be possible to assign credential profiles to individual credentials to determine the number of days of non-use before they expire.
   g. It shall be possible to set expiration dates for individual credentials in a person record. When a Network Controller encounters an expired person record during its nightly system check, it shall modify that person record from “Active” to “Expired”. Similarly, if an expired person record is set to “Temporary”, it shall be changed to “Temporary Expired”.
      1) To reactivate “Expired” and “Temporary Expired” credentials, a system user with appropriate user role permissions may edit the person record in the User Interface, and modify the expiration date to a future date/time. Once the record is saved, the person record status will be changed to “Active” or “Temporary”.
   h. It shall be possible to specify that any credential not used within a specific number of days from the date it was issued will be disabled automatically.
   i. To ensure that all new and modified credentials have expiration dates, a user with Setup privileges can enable a credential expiration requirement option for the system.
When this option is enabled, users will be prevented from saving new and modified credentials that do not have expiration dates. The API shall enforce this by requiring that a valid expiration date be passed when a command is issued to add or modify a credential.

j. The “First Name”, “Middle Initial”, and “Last Name” fields of each Person Record shall allow for up to 50 characters each.

k. The system shall provide for a workflow to be configured to facilitate processing of lost and/or forgotten credentials.

l. The system shall track credential status information and make it available for use in creating up-to-the-minute credential status reports.

9. Enrolling new people:
   a. All person data entered into the system shall be held in the system database and shall be available only to system users holding at least an Administrator user role.
   b. Person data can be added, deleted, and edited by users holding at least an Administrator user role.
   c. The system shall support person record templates.
      1) Each template defines values for specific fields, such as a default set of access levels.
      2) These values will be filled in automatically in any person record created from the template.
      3) When adding a person to the system, a user shall be able to use one of the available templates in the active partition to create the person record, or create it without a template.
      4) Person Record Templates shall be available for use in custom People report definitions and in person search criteria.

10. Creating Photo IDs - The system shall include an integrated photo ID function. It shall be possible:
    a. To design badge layouts.
    b. To upload badge layouts for badge printing.
    c. To capture ID photo images, print badges, and delete uploaded badge layouts.
    d. For the system user to manage all photos ID functions entirely from within the browser.
    e. To track the number of times a badge has been printed.
    f. To print multiple badges at once using the Badge Print Workflow.
    g. To enroll a person’s card number manually or through a reader and save the new credential from the Badge Print Workflow.
    h. The system shall be capable of automatically generating auto-incremental encoded credential numbers. Each new encoded credential number shall be increased by one over the next highest number in the system.

11. Configuring network resources:
    a. S2 Cumulus registration - The system shall support the registration of an SMS with S2 Cumulus to support cloud-based monitoring and administration of the system from a single management dashboard.
    b. Microsoft Active Directory Data Synchronization - It shall be possible to configure an Active Directory (AD) server for data synchronization:
       1) Each S2 NetBox shall support up to 10 AD server connections.
       2) A user with the Full System Setup role shall have the ability to create up to 10 configurations for synchronizing data, with the same AD server or with different AD servers.
       3) Each configuration shall allow the synchronization of: (1) person attribute values stored on the AD server with values displayed in person records on the S2 NetBox, and (2) security group assignments on the AD server with access level assignments on the S2 NetBox.
    c. Microsoft Active Directory User Authentication - It shall be possible to configure an Active Directory (AD) server for user authentication:
1) The configuration shall provide single user-login capability.
2) Password rules and authentication will be governed by the AD server.

d. Domain Name Servers (DNS) - The system shall support setting IP addresses for up to two domain name servers.
e. Email settings - The system shall support the use of email notifications of alarm events.
1) The system user must setup the email server IP address or DNS name and the email address of the Network Controller.
2) A network administrator must setup the network mail server to relay email for the IP address of the Network Controller.
3) When setting up an email relay, users shall be able to select a port number other than 25 to indicate that the system should attempt to use encrypted SSL connections for the outgoing messages. If an encrypted connection is not available, then the system will fall back to port 25 for an unencrypted connection.

f. File Transfer Protocol (FTP) - The system shall support the use of an FTP or SFTP Server for backups. Once configured, backups are automatically saved to the FTP server on a daily basis.

g. Network Attached Storage (NAS) - The system shall support the use of NAS for network storage of backups and Data Operations Import files. Once configured, the system data is saved to a network storage location on a daily basis.
1) The network administrator must create a domain user account for the Network Controller and a password.
2) The system user must configure the network attached storage in the system, including the domain name, server IP address, share name, and the directory where the Network Controller may store data.
3) The system user can select a security protocol (ntlm, ntlmi, ntlmv2, ntlmv2i, ntlmssp, or ntlmsspi) to be used for authentication when communicating with the remote server.
4) The system user can also select the version of the Server Message Block (SMB) network file sharing protocol the NAS is set to use.

h. Time sever - It shall be possible for a system user to set up a primary Network Time Protocol (NTP) server and, optionally, secondary and tertiary NTP servers. The Network Controller’s use of an NTP server will ensure the system will be synchronized regularly with the exact time used by all other network resources.
i. Remote logging - It shall be possible for a system user to set up remote logging. This will ensure that messages generated by the SMS will be forwarded to a remote host running the Rsyslog daemon.
j. A system user holding at least a Setup user role shall be able to configure network resources. Configuring an Active Directory server for data synchronization requires the Full System Setup user role.

12. Data Operations:
   a. View - Users having the “Data Operations: View” user role permission shall be able to view the results of data operations. Depending on which other user permission roles assigned to them, they may also be able to add person records (including access level, credential, and user defined person record information) to the SMS, and modify and delete existing person records.

   b. Import File - Shall enable the user to manually upload (import) tab-separated or comma-separated (CSV) text files.

   c. Export File - Shall enable the user to manually download (export) CSV text files.

   d. Automatic Import - Shall enable the system to process an Import File at scheduled intervals from a pre-configured NAS location.

   e. Automatic Backups - Shall support the use of network attached storage (NAS) devices for automatic backup of Data Operations Import files to a network storage location.
f. Person Record Management - Data Operations shall provide the user interface to import person record CSV data to the S2 NetBox SMS. Data Operations shall also be the interface for exporting the complete set of current access level and credential configuration of existing person records from an S2 NetBox SMS to an external target system.

2.05 MAGIC MONITOR INTEGRATION

A. The S2 Magic Monitor Network Security Management System shall provide a single client management application for the security system.

B. S2 Magic Monitor shall integrate with S2 NetBox SMS systems.

C. S2 Magic Monitor software shall be available to be installed as a native client.
   1. Supported Operating Systems
      a. Windows 10
      b. macOS Sierra
      c. macOS High Sierra

D. The S2 Magic Monitor appliance shall be available as a single monitor/TV appliance or a multi-monitor solution.

E. The S2 Magic Monitor solution shall provide the ability to operate in a secure access mode that requires the application to use existing credentials from the S2 NetBox or S2 NetVR and shall not require duplication of users
   1. Login credentials shall be able to be managed as a single credential over the video, access-control and S2 Magic Monitor client operations.
   2. S2 Magic Monitor software shall provide a standalone mode with no requirement to authenticate with the S2 NetBox and shall provide the ability to add network video recorders and access controllers with local credentials.
   3. Security of the data communicated over the network to and from the S2 Magic Monitor software shall be protected by encryption (SSL 128-bit) or authentication (TLS).
   4. S2 Magic Monitor shall provide the ability to be set as an active client for video, access control and event management or as a standalone remote managed screen for video and public safety notifications.

F. S2 Magic Monitor shall provide the ability to search for person records in SMS systems, and to view, edit, and add person records, based on the user’s permissions on these systems.

G. S2 Magic Monitor shall provide live real-time monitoring of access-control activity data, and video verification in real time over local and wide area networks.

H. S2 Magic Monitor shall provide the ability to view recent activity at a portal defined on an SMS, and to momentarily unlock a portal, based on the user’s permissions on the SMS.

I. S2 Magic Monitor shall provide the ability to show video based on access control activity, live or recorded, and the option to view image from the card holder database based on the access control activity.

J. S2 Magic Monitor shall support simultaneous access to video, data, alarms and events from multiple servers.

K. S2 Magic Monitor shall support ability to span client into multiple direct attached monitors.

L. The S2 Magic Monitor client shall show live operation video, access control data, pop up events and push notifications, and life safety or any other digital signage graphics.

M. S2 Magic Monitor shall allow for the creation of custom layouts, including up to 400 cells.

N. S2 Magic Monitor shall be able to manage multi-media content:
   1. Video Streams
   2. Access Control Activity
   3. Cardholder Images
   4. Images to be used in digital signage [.jpg and .png]
   5. Video Clips [MP4 and MOV]
6. Date and Time
7. Weather
8. Traffic
9. Information from private and public RSS feed
10. Twitter® feeds
11. Pandora® Radio
12. YouTube TV
13. Web content
14. Text

2.06 VIDEO MANAGEMENT SYSTEM INTEGRATION

A. General: The SMS shall support the integration of Milestone Video Management Systems Network Video Recorders (NVR). This integration shall allow the viewing of live streaming video in the browser interface and recorded video playback. Viewing live streaming video shall require the Java™ 2 Runtime Environment version 1.4.2 or version 5.0.

1. Events in the alarm subsystem can initiate video recording. Video motion detection and camera up/camera down messages from the VMS can initiate alarms.
2. It shall be possible to monitor DVR and NVR cameras in the same views as direct IP cameras. VMS events shall be logged in the system Activity Log. It shall be possible to view recorded video of events from the Activity Log.
3. It shall be possible to view live cameras through floor plans, on the camera view pages, on the Monitoring and Widget Desktops.
4. It shall be possible to pull up recorded video through reports.

2.07 ASSA ABLOY REMOTE LOCKSET INTEGRATION

A. The SMS shall support the integration of ASSA ABLOY Wi-Fi enabled locksets (models v.S2, p.S2, and IN120) and PoE locksets (models v.S1, p.S1, and IN220).

1. The system shall support more than 500 remote locksets; each Network Controller configuration shall be rated for the number of locksets it can support.
2. Once a lockset is installed and registered with the Network Controller, it appears in the security application as a “remote lockset” node, which can be enabled and configured to work with the Network Controller.
3. When a remote lockset connects to the Network Controller, it shall report its power type, which is encoded in its serial number.
   a. A lockset reporting having PoE or direct hardwired power shall be treated as an online lockset and assigned the Default (Online) lockset profile.
   b. A lockset reporting having only batteries as a power source (such as a Wi-Fi lockset) shall be treated as an offline lockset and is assigned the Default (Offline) lockset profile.
   c. The offline remote lockset shall update the Network Controller with the current voltage level of its battery upon each connection.
   d. Clearing the “Online” check box on the Advanced tab of the Network Nodes page will change an online lockset communication status to offline.
   e. The default lockset profile automatically assigned to the lockset the first time it connects to the system shall be editable.
4. It shall be possible to set configuration options for a remote lockset to change its call-in and unlock behaviors.
5. It shall be possible to configure the reader and portal that were automatically created for a remote lockset.
6. It shall be possible to view cached information for a remote lockset, for troubleshooting purposes.
7. It shall be possible to specify special-use formats for access cards to be used with remote locksets.
8. The remote lockset shall be able to send high priority events to the Network Controller.
9. It shall be possible to schedule an automatic unlock period for remote-lockset portals. The start of this period can be triggered by time or by an initial valid card read.
10. It shall be possible to select a check box when creating a magnetic stripe ABA Track 2 card format to ensure that the format will be recognized by remote locksets with magnetic stripe card readers.

11. It shall be possible to create remote lockset profiles to assist in the configuration and management of large numbers of remote locksets. A lockset profile is a defined set of attributes that affect lockset behaviors. Assigning a profile to a lockset gives it the attributes defined in the profile. Any subsequent changes made to the profile are applied to the lockset automatically.

12. Locksets shall support PIN-only credentials.

13. It shall be possible to specify a voltage level below which an offline lockset will go into power saving mode. If a Low Battery event is enabled for the lockset, the event will be triggered. Once the battery is replaced, the lockset will leave power saving mode only when the voltage level reaches 1.5 Volts higher than its current Low Voltage setting.

14. It shall be possible for a lockset to check for permissions with the host (controller) for a person that is not yet stored in the lockset.

15. Online locksets shall have the same capabilities as offline locksets with the following additional capabilities:
   a. Online locksets can be assigned to locations; changes to a location's threat level can cause the locksets in that location to enter and exit panic mode.
   b. Online locksets shall have momentary unlock capability while in panic mode (by means of an event action or button on the portal status page).
   c. Online locksets shall be capable of persistent unlock or lock mode (by means of an event action or button).
   d. Online locksets can be added and managed in floorplans.
   e. Online locksets can be unlocked momentarily via event actions or from the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.
   f. Online locksets shall be capable of performing scheduled locks or unlocks via event actions, or from buttons on the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.
   g. Online locksets shall be capable of being switched to a locked or unlocked state, and be disabled or enabled using buttons on the Portal Status page.
   h. Online locksets shall be capable of being enabled and disabled via buttons on the Portal Status page.
   i. Activity associated with an online lockset can be viewed in real time in the Activity Log.

2.08 S2 MOBILE SECURITY PROFESSIONAL™

A. S2 Mobile Security Professional (S2 MSP) shall be a mobile application for use with Apple iPad tablets and Apple iPhone running iOS 10 and later and Android devices running 4.4 and later. S2 MSP shall enable wireless tablet users to monitor and control various features of the SMS. It shall be possible to view multiple S2 NetBox controllers that are connected to a single S2 MSP.

1. Activity Monitoring - Users shall be able to view recent activity from the SMS Activity Log. Users shall be able to select specific Activity Log entries to view associated records, such as person record details, play live and recorded video, and change the status of specific portals.

2. View Person Details - Users shall be able to search for persons by name, and view associated person records. Users shall be able to photograph persons using the camera on their tablet or phone, and record these in the SMS.

3. Live Video Monitoring - Users shall be able to display thumbnail images of every S2 NetVR camera view integrated with the SMS. Users shall be able to select individual thumbnails, which shall display live video from the corresponding camera.

4. Mobile Mustering - The application shall support a mustering process using a mobile device to allow regional evacuation, unimpeded by access control constraints. Users shall be able to initiate and terminate multiple evacuations simultaneously. The system shall enable users to determine if all persons known to be present within a given region have
been accounted for. The system shall be capable of managing mustering points simultaneously.

5. Photo ID Capture - Takes an ID photo directly from the app.
6. Portals - Enables momentary unlock of any portal in the system. Portals shall also show the live video of the camera associated with the portal.

2.09 THIRD PARTY SSL CERTIFICATE SUPPORT
A. It shall be possible to configure an SSL certificate that will provide encryption alone, or encryption plus authentication. The available options are:
   1. Generating a self-signed SSL certificate, this is signed with the embedded web server’s own private key. This certificate shall provide encryption but not authentication. Users will need to override their security warnings, or accept the certificate as trustworthy into their browser key ring.
   2. Generating an SSL certificate that is signed by a certificate authority (CA). This certificate shall provide both encryption and authentication.
   3. Uploading your own SSL certificate and matching key to the Network Controller. Optionally, it shall be possible to upload a chain, or intermediate, file that links the certificate to a trusted root certificate. This provides both encryption and authentication.

2.10 PIVCHECK INTEGRATION (HID)
A. The SMS shall support the integration of HID’s PIVCheck PIV/TWIC/CAC/FRAC. This integration allows for:
   1. Support for FIPS-201 Credentials
   2. Authentication of PIV, TWIC, CAC, and FRAC credentials.
   3. Validation against a certificate revocation list.
   4. Enrollment of information contained within the credential imported directly into the S2 NetBox database.

2.11 VISITOR MANAGEMENT SYSTEMS INTEGRATION
A. The SMS shall be able to integrate with a variety of industry leading visitor management products. The integration allows for visitor information to be shared with SMS, providing the ability to assign credentials to visitors as well as running reports on activity. There is no additional cost or license fee from S2 for integrating with these visitor management systems with the SMS application.

B. The following visitor management companies have written integrations to the SMS using the NBAPI:
   1. Jolly - Lobby Track
   2. HID - EasyLobby
   3. STOPware - PassagePoint
   4. Veristream - iVisitor
   5. Angus
   6. ProxyClick
   7. Splan
   8. Envoy

C. Fees associated with integration of third-party visitor management systems may be applicable, depending on the manufacturer.

2.12 API INTEGRATION
A. An application programming interface (API) is provided for the S2 NetBox/S2 NetBox VR/S2 NetBox Enterprise SMS. The API provides programmatic access to the network-connected components managed by the SMS.
   1. Communication between the SMS and another application takes place through the TCP/IP networking protocol. The API is invoked by posting an HTTP message to the web server on the Network Controller.
   2. The SMS database includes a table of “people” whose records act as container objects for attributes attached to people in real life. People are mapped to access levels, which
specify access privileges-and to access cards, whose credentials are used for access control.

3. Access levels are created in the system using the normal web user interface for the SMS. People and credentials may be entered into the system either through the web user interface or through the API.

4. It shall be possible to assign a custom user role that will allow a user to log into the SMS only through the API.

5. The API supports commands for:
   a. Adding, modifying, removing, and retrieving data about a person, and retrieving information about one or more people based on various search criteria.
   b. Adding, modifying, and removing credentials, and retrieving a list of the names of defined card formats.
   c. Adding, modifying, and deleting access levels, and retrieving a list of the valid access levels in the system.
   d. Adding, modifying, and deleting access level groups, and retrieving a list of the valid access levels groups in the system.
   e. Pinging the SMS to determine its health, and retrieving the current version of the API from the server.
   f. Retrieving a history of access activity, either for all users or for a particular access card.
   g. Adding, modifying, and removing threat levels and threat level groups, and setting the threat level in the system.
   h. Retrieving a list of portals and associated card readers defined for the SMS.
   i. Adding, modifying, deleting, and retrieving time specifications and time specification groups.
   j. Adding, modifying, and deleting holidays, and returning a list of holiday keys or a specific holiday.
   k. Adding, modifying, and deleting readers and reader groups, and returning a list of reader group keys or information for a specific reader group.
   l. Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.
   m. Requesting events from the Activity Log that occurred within a specified time period. These events are returned from the API in the CSV Export report format.
   n. Activate or Deactivate Output: Requests that the output specified by an output key value be activated or deactivated.
   o. Momentarily unlocking the portal specified by a portal key value.
   p. Locking or unlocking the portal specified by a portal key value.
   q. Support for credential IDs, which are aliases for actual credential numbers. As a security measure, credential IDs can be retrieved and stored in a client system in place of the encoded numbers and/or hot stamps.
   r. Adding, modifying, and deleting UDF value lists, and retrieving a list of the UDF value lists defined for the SMS.
   s. Recording Access Granted and Access Denied events in the Activity Log, and inserting a user-defined event that displays a text string in the Activity Log.

2.13 HIGH AVAILABILITY (HA) SOLUTION

A. The system shall support S2’s High Availability (HA) Solution. The HA Solution includes an HA server pair consisting of two S2 NetBox Enterprise 100 servers running Stratus Technologies everRun® Express high availability virtualization software. The servers act as a platform for the S2 software and operating system as a virtual machine on one server, which is continually backed up on the other server.

1. A Hot Standby implementation shall use a failover cluster consisting of a pair of identical co-located Network Controllers. One Controller shall have the primary, or active, role and the other a secondary or passive role.

2. The Hot Standby implementation shall support operation from either Network Controller, but not from both simultaneously. Under normal redundant operation, the primary
Controller shall perform all operations and shall mirror its data onto the secondary Controller.

3. The two Network Controllers shall be linked by a heartbeat network connection they shall use to monitor and communicate with each other. They shall share a virtual IP address to be used for communications with Network Nodes and other devices.

4. Should the primary Controller fail, the secondary Controller shall be available to provide service through a process called failover. Administrators shall be alerted that a failover has occurred so they can take appropriate measures to restore the Hot Standby implementation.

2.14 S2 NETBOX OFFSITE RECOVERY

A. S2 NetBox offsite recovery shall support the ability to configure two Network Controllers in a primary/secondary configuration.
   1. On the primary Network Controller, all Network Nodes shall be configured with a secondary Controller’s IP address.
   2. The Network Nodes shall initially connect to the primary Network Controller.
   3. In a disaster recovery scenario in which the primary Network Controller becomes unavailable, the offsite recovery feature shall support a manual switchover command on the secondary Network Controller.
   4. The switchover command shall only be able to be manually executed by an S2 administrator.

2.15 S2 CUMULUS® REMOTE MONITOR AND ADMINISTRATOR

A. The system shall support cloud-based monitoring and administration of S2 access control and video systems from a single management dashboard.

B. S2 Cumulus shall support S2 NetBox, S2 NetVR, S2 Global, and S2 Magic Monitor.

C. S2 Cumulus shall support remote monitoring of the following:
   1. The last communication with Cumulus
   2. Status of the CPU
   3. Memory and network bandwidth usage

D. S2 Cumulus shall support the managing of system licenses, including:
   1. OS version
   2. S2 software version
   3. SUSP expiration date
   4. Detailed license information

E. S2 Cumulus shall support remote updating of the system’s software

F. S2 Cumulus shall be accessible through the S2 Integrator Portal

G. S2 Cumulus shall not require ports to be opened for communications from the S2 NetBox, S2 NetVR, S2 Global, or S2 Magic Monitor.

H. S2 Cumulus shall support the sending of email or text alerts to system users when a system has an error.
   1. Alerts shall be able to be grouped together

2.16 ACCESS CONTROL EQUIPMENT

A. Manufacturers: All equipment Furnished under this section shall be standard product offer by Allegion, reference Division 08.

B. Card Readers: HID iClass SE
   1. Mullion Mount: iClass SE R10
   2. Single Gang: iClass SE R40
   3. Single Gang with Keypad: iClass RK40

C. Door Contacts: Schlage
   1. Overhead Doors: #674-OH
   2. Surface Mounted: #7766
3. Concealed: #679-05HM

D. Push-Button Switches:
   1. Momentary Door Release Pushbutton: Schlage 660 Series

E. Motion Sensors: Bosch D5160

F. Credential Cards:
   1. HID iClass SE #3000PG1MN
   2. Quantity: 10,000
   3. Provide unique facility code and starting number

G. Identity Management
   1. Product: S2-IDC-128
   2. Quantity: (1) one
   3. Product: S2-IDA-128
   4. Quantity of (4) four

H. Power Supplies
   1. Power supplies for power to doors shall be provided by this contractor. Provide power supplies as required to accommodate door controller power in each controller location. Coordinate power supply compatibility with door hardware components prior to ordering.
   2. Altronix

2.17 CABLEING
   A. All access control cabling shall be plenum rated. Provide cable size/quantity configuration for each device required to perform function specified.

   B. Manufacturers:
      1. West Penn
      2. Belden

   C. All-in-one Composite Cable: West Penn #AC251822B

   D. Door Contact Cable: West Penn #25221B, minimum

   E. REX: West Penn #25241B, minimum

2.18 SURGE PROTECTION:
   A. Ditek: DIK-4LVLPDR

PART 1 EXECUTION

3.01 EXAMINATION
   A. Examine cable pathways including conduit, raceways, cable trays, and other pathway elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

   B. Examine rough-in for control cable and conduit systems to controllers, card readers, and other system components to verify conduit and back-box locations prior to installation of system devices.

   C. Examine available network capacity and support infrastructure. Consult with network administrator for compliance with network standards and capacity.

   D. Examine install location for compliance with space allocations, installation tolerance, hazards to safe system operation, and other conditions affecting installation.

   E. Examine roughing-in for LAN, WAN, and IP network before device installation.

3.02 PREPARATION
   A. Comply with SIA CP-01 Control Panel Standard.

   B. Comply with ANSI/TIA-606-B Labelling Standard.
C. Prepare detailed project planning forms for programming and configuration of the SMS. Fill in all data available from project plans and specifications and publish as project planning documents for review and approval. These may include (but are not limited to):
1. Define SMS Partitions.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, software triggers, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish trigger actions between events and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
10. Discuss badge layout options; design badges.
11. Complete system diagnostics and operation verification.
12. Prepare a specific plan for system testing, startup, and demonstration.
13. Develop acceptance test concept and, on approval, develop specifics of the test.
14. Develop cable and asset-management system details; input data from construction documents. Include system schematics and technical drawings in electronic format.
15. In meetings with Engineer and Owner, present Project planning documents and review, adjust, and prepare final programming and configuration documents. Use final documents to program and configure software.

3.03 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction".
B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
   1. All cabling shall be concealed, either in raceway or above ceiling.
   2. Where cables enter any box and appropriate fitting shall be used.
   3. Cables shall be properly supported every 4 to 6 feet, where not installed in raceway, independently from structure. Use of ceiling wires, ductwork, piping, etc. is not acceptable. Cabling shall be routed parallel and perpendicular to building structure.
C. Install LAN cables per Section 271005 “Structured Cabling” using techniques, practices, and methods that are consistent with Category 6 rating of components and fiber-optic rating of components, and that ensure Category 6 performance of completed and linked signal paths, end to end.
D. Junction boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with tamper resistant fasteners and/or tamper detection switches. In addition, hinged enclosure doors shall be equipped with locking hardware. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws. Reference Sections 260533.16 "Boxes for Electrical Systems" and 262716 “Electrical Cabinets and Enclosures”.
E. Install end-of-line resistors at the field device location and not at the controller or panel location.
F. Card Readers and Keypads and Peripheral Devices:
   1. Install number of conductor pairs recommended by device manufacturer for the functions specified.
   2. Follow device manufacturer’s installation requirements for maximum cable distances and sizes.
G. Where penetrating any wall above ceiling provide conduit sleeve minimum length of 1FT supported on both sides of wall. Provide firestopping where required.
3.04 FIRESTOPPING

A. Comply with TIA/EIA-569-A; Annex A, "Firestopping."
B. Select appropriate type or types of through penetration firestop devices or systems appropriate for each type of communications penetration and base each selection on criteria specified herein.
C. Use firestop devices for all wall, floor, and roof penetrations.
D. Putty or caulk is only to be used on small penetrations.
E. Selected systems shall not be less than the hourly time delay ratings indicated in the Contract Documents for each respective fire-rated floor, wall, or other partition of building construction. Firestop for each type of communications penetration shall conform to requirements of an independent testing laboratory design drawing or manufacturer's approved modification when used in conjunction with details shown on the Drawings.
F. Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction with respect to size and shape of each opening to be constructed and device or system approved for use in each instance.

3.05 IDENTIFICATION

A. Label, in plain English, each end of each cable, field panel, patch panel, network switch, or cabinet.
B. Each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the device as shown.
C. At completion, cable and asset management documentation shall reflect as-built conditions.

3.06 CREDENTIALING

A. Integrator shall program the first 100 cards, while training owner.
B. Provide additional support to owner as needed during first year.

3.07 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved.
B. Assign the software license(s) to Owner.
C. All default password shall be changed to those selected by the owner.
D. The contractor shall retain no records of passwords for the project.

3.08 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
B. Factory Commissioning: Onsite visit by the Manufacturer's in-house personnel to inspect, test, and assess system programming, functionality, and performance.
C. Tests and Inspections:
   1. Inspection: Confirm that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
   2. Pretesting: Configure and pretest system components, wiring, and functions to confirm that they comply with specified requirements.
   3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements.
   4. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least <14 days>. Provide a minimum of 10 days' notice of test schedule.
5. Operational Tests: Perform operational system tests to confirm that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

D. The system is considered defective and the project incomplete if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.09 STARTUP SERVICE
A. Engage a factory-authorized service representative to supervise and assist with startup service.
B. Provide onsite visit by Manufacturer’s in-house personnel to train Owner’s operations personnel.
C. Complete installation and startup checks according to approved procedures that were developed in “Preparation” Article and with manufacturer’s written instructions.
D. Enroll and prepare badges and access cards for Owner’s operators, management, and security personnel.

3.10 ADJUSTMENTS
A. Occupancy Adjustments: When requested within 30 days of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project for this purpose. Tasks shall include, but are not limited to, the following:
   1. Check cable connections.
   2. Check proper operation of cameras streams and storage configuration.
   3. Confirm system configuration and adjust settings needed.
   4. Recommend changes to the system to improve Owner’s use.
   5. Provide a written report of adjustments and recommendations.

3.11 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain the system equipment.
B. Develop and provide separate training modules for the following:
   1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
   2. Operators who prepare and input credentials, monitor the SMS, and to enroll personnel.
   4. Hardware maintenance personnel.
   5. Corporate management.

END OF SECTION 28 13 16
SECTION 28 20 00  
VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Video surveillance system requirements. Reference Section 28 20 13
   B. Cameras.
   C. Accessories.

1.02 RELATED REQUIREMENTS
   A. Section 07 84 00 - Firestopping.
   B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   C. Section 26 05 29 - AND SUPPORTS FOR ELECTRICAL SYSTEMS.
   D. Section 26 05 33.13 - CONDUIT.
   E. Section 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
   F. Section 27 10 05 - STRUCTURED CABLING: Data cables for IP video surveillance system network connections.
   G. Section 28 13 16 - Security and Database Management System
   H. Section 28 20 13 - Video Surveillance system.

1.03 REFERENCE STANDARDS
   A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
   C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
      2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
      3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
   B. Preinstallation Meetings:
      1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.
      2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

1.05 SUBMITTALS
   A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.
   C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
D. Evidence of qualifications for installer.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
F. Field quality control test reports.
G. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.
H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE
A. Comply with the following:
   1. NFPA 70.
   2. Applicable TIA/EIA standards.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.
E. Maintenance Contractor Qualifications: Same entity as installer.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.
B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS
A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY
A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Video Recording and Viewing Equipment - Basis of Design: Milestone Corporate.
B. Cameras:
   1. As Scheduled on the plans.
2.02 CAMERAS
A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.
B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.
C. Lenses:
   1. Where not factory-installed, provide lenses matched to cameras and the intended application.
D. Camera Enclosures and Mounting Brackets:
   1. Where not factory-installed, provide accessory camera enclosures suitable for operation under the service conditions at the installed location.
   2. Where not factory-installed, provide accessory camera mounting brackets necessary for installation.

2.03 ACCESSORIES
A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.
B. Provide cables as indicated or as required for connections between system components.
C. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive system components.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.
B. Install products in accordance with manufacturer's instructions.
C. Provide required support and attachment in accordance with Section 26 05 29.
   1. Anything mounted to acoustical ceiling tile, shall be provided with appropriate bracket spanning the grid.
D. Wiring Method: Unless otherwise indicated, use CAT 6 Cabling.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use listed plenum rated cables in spaces used for environmental air.
   3. Install wiring in conduit for the following:
      a. Where required for rough-in.
      b. Where required by authorities having jurisdiction.
      c. Where exposed to damage.
      d. Where installed outside the building.
      e. For exposed connections from outlet boxes to cameras.
   4. Conduit: Comply with Section 26 05 33.13.
   5. Conceal all cables unless specifically indicated to be exposed.
   6. Cables in the following areas may be exposed, unless otherwise indicated:
      a. Equipment closets.
7. Include service loop cable lengths to allow relocation of cameras within 15 ft of installed location.

E. Provide grounding and bonding in accordance with Section 26 05 26.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

G. Identify system wiring and components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.
   1. Coordinate final programming of all cameras with Owner.

D. Test for proper interface with other systems.

E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

A. Provide trouble call-back service upon notification by Owner:
   1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 28 20 00
SECTION 28 20 13
MILESTONE VIDEO MANAGEMENT SYSTEM

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION
   A. General Requirements
      1. The specified product shall be of manufacturer’s standard product line, designed for
         commercial.
      2. The specified software shall be based upon an open platform with the ability to have
         external programming interfaces and published protocols.

1.02 DEFINITIONS AND STANDARDS
   A. General abbreviations, acronyms and standards
      1. ACC: Video Codec “Active Content Compression
      2. ADDS: Active Directory Domain Services
      3. AGC: Automatic gain control
      4. API: Application Programming Interface
      5. Bit Rate: The number of bits/time unit sent over a network
      7. DHCP: Dynamic Host Configuration Protocol
      8. DVR: Digital Video Recorder
      9. DNS: Domain Name System
     10. FPS: Frames per Second
     11. FTP: File Transfer Protocol
     12. GbE: Gigabit Ethernet (1000Mbps)
     13. H.264/5 (Video Compression Format)
     14. IEEE 802.1x: Authentication framework for network devices
     15. IP: Internet Protocol
     16. JPEG: Joint Photographic Experts Group (image format)
     17. LAN: Local Area Network
     18. Lux: A standard unit of illumination measurement
     19. MPEG: Moving Picture Experts Group
     20. Multicast: Communication between a single sender and multiple receivers on a network
     21. NTP: Network Time Protocol
     22. NTSC: National Television System Committee - a color encoding system based on 60Hz
     23. ONVIF: Global standard for the interface of IP-based physical security products
     24. PoE: Power over Ethernet (IEEE 802.3af/at) standard for providing power over network cable
     25. Progressive scan: An image scanning technology which scans the entire picture
     26. PTZ: Pan/Tilt/Zoom
     27. SDK: Software Development Kit
     28. RAID: Redundant Array of Independent Disks
     29. SMTP: Simple Mail Transfer Protocol
     30. SNMP: Simple Network Management Protocol
     31. SSL: Secure Sockets Layer
     32. TCP: Transmission Control Protocol
     33. TLS: Transport Layer Security
     34. Unicast: Communication between a single sender and single receiver on a network
     35. UPnP: Universal Plug and Play
     36. VMS: Video Management System

1.03 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract.
   B. Related Specification Sections:
1. Division 08 - Door Hardware  
2. 26 01 01 - Common Electrical Work  
3. 26 05 19 - Low-Voltage Electrical Conductors and Cables  
4. 26 05 33.13 - Conduit for Electrical Systems  
5. 26 05 33.16 - Boxes for Electrical Systems  
6. 26 05 53 - Identification for Electrical Systems  
7. 28 13 13 - S2 Security Global Security Operations Center  
8. 28 20 00 - Video Surveillance  
9. 28 20 13 - Milestone Video Management System

1.04 QUALITY ASSURANCE
A. The Integrator shall be a licensed security Contractor with a minimum of five (5) years’ experience installing and servicing systems of similar scope and complexity.
B. All software and camera installations, configuration, setup, program and related work shall be performed by software/electronic technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.
C. The Integrator shall submit certifications from the manufacturer of the equipment from the last two years of the highest level of training provided.
D. The Integrator shall have 24/7/365 service technicians and be a stocking contractor of the manufactures equipment. The Integrator shall be able to respond to a service call on site and have trained resources within 50 miles of the owner’s location.

1.05 SUBMITTALS
A. Product Data
1. Complete product and technical data specification sheets that include all material and equipment shall be provided.
B. Shop Drawings
1. Connecting riser diagrams for all interfacing equipment
   a. List of all equipment with part numbers
   b. Locations for all components to be installed under this scope of work
C. As-Built Drawings
1. At the completion of the project, the Integrator shall provide as-built drawings that are the changed version of the shop drawings as modified by field conditions.
   a. All device address shall be indicated on the as-built drawings.

1.06 CONTRACTOR REQUIREMENTS
A. The Contractor/Integrator shall have a supporting office within fifty (50) miles of the project location.
B. Certifications: Four (4) technicians from the supporting office shall hold current Milestone certifications.
C. On-site maintenance and repair service shall be available locally and within four (4) hours of notification of condition.
D. On-site Contractor personnel shall hold all required local, state, and federal licenses.
E. On-site Contractor personnel shall hold current certifications with S2 Security.
F. The Contractor shall provide three (3) references for completed projects of similar scope.
G. List of Approved Contractors shall be provided in Addendum following mandatory Pre-Bid walk throughs.

1.07 WARRANTY
A. The security system VMS software and labor furnished by the integrator including wiring, software, hardware and third party products shall be fully warranted for parts, materials and labor for a minimum of one (1) year from date of the final acceptance of the Video Surveillance System.
1. Free access to all new software service releases during the warranty period.
2. Free access to all new device driver packs
B. Additional years of software upgrades shall be available for purchase separately:
   1. Provide five (5) year product software support with all new licenses.
   2. Provide upgraded five (5) year Corporate support on existing Licenses.

PART 2 PRODUCTS
2.01 GENERAL
A. The VMS shall utilize an (SDK) which enables seamless integration of video analytics algorithms and other third-party applications in XProtect Smart Client and Management Client.
B. The integration option shall support Milestone ONVIF Bridge that enables full video interoperability in multivendor installations using a standardized ONVIF compliant video-out interface.
C. Generic event integration shall enable easy and fast integration of third-party applications and systems via a simple message-based socket communication interface.
D. The system configuration API shall enable external applications to make changes to the system’s configuration.

2.02 SPECIFIED PLATFORM
A. The Video Management System shall be Xprotect Corporate as manufactured by Milestone Systems and supplied by a Certified Factory representative.

2.03 RECORDING SERVER
A. The system shall facilitate simultaneous digital multi-channel MJPEG, MPEG4, MPEG-4 ASP, MxPEG, and H.265 video recording of IP cameras and IP video encoders without any software limitations on number of cameras per server.
B. The two-way audio shall allow users to transmit and record audio from connected microphones and audio from the operator’s microphone to attached speakers.
C. The generic framework shall receive and store metadata from compatible devices and clients.
D. Route traffic between multiple connected cameras and multiple clients shall be able to request live view, playback and export.
E. The system shall multicast one video stream to all XProtect Smart Clients. The infrastructure must support IGMP to reach remote networks.
F. Multi-live streaming shall give the possibility to define multiple streams for live viewing with different properties. It shall optimize XProtect Smart Client viewing performance according to the available bandwidth and view layouts, which is ideal for deployments with remote viewing.
G. A dedicated recording stream shall enable optimization stream properties (resolutions, encodings and frame rate) for video storage and forensic usage.
H. The system shall secure high speed recording database holding JPEG images or MPEG4, MPEG-4 ASP, MxPEG, H.264 or H.265 streams.
I. Flexible control of recording characteristics for MPEG4/H.264/H.265 streams, shall make it possible to toggle between recording key frames only or the full stream.
J. The system shall record more than 30 frames per second per camera, limited only by hardware. Recording quality shall depend entirely on camera and video encoder capabilities with no software limitations.
K. Pre-recording buffer (used for event/motion based recording) in RAM shall minimize the disk read/write operations when no video is recorded.
L. Edge Storage with flexible retrieval shall enable video retrieval from camera storage based on time schedules, events or manual requests. This shall enable users to effectively retrieve video recordings across low-bandwidth connections.
M. Scalable Video Quality Recording™ (SVQR) shall enable seamless merging of video stored centrally in the recording server, and video retrieved from a camera associated edge storage, or interconnected system.

N. The system shall enable the possibility to import pre-event images recorded locally in camera or video encoder.

O. Built-in, real-time, camera-independent motion detection with the ability to generate motion metadata for Smart Search.

P. The recording server shall run as a Windows service under local system account or optional local Windows user or Microsoft Active Directory account with run-as-a-service privileges.

Q. Port forwarding shall enable clients to access the recording servers from outside a network address translation (NAT) firewall.

R. The system shall support for both IPv4 and IPv6 addressing.

S. The 64-bit recording servers shall allow more cameras to be run on a single server unit.

T. The secure HTTPS camera connection on devices shall support HTTPS.

U. Digital signing of the recording server’s video database shall be used to verify that recorded video has not been modified or tampered with while stored in the XProtect Corporate system or after export.

V. Remote Connect Services shall enable you to securely connect remote cameras across different types of private and public network.

W. Pan-tilt-zoom (PTZ)
   1. Clients with user priority shall “Pass-through” control of manual PTZ operation.
   2. XProtect Corporate shall be able to identify 32,000 PTZ priority levels for control of rights between different operators and automatic patrolling schemes.
   3. XProtect Corporate shall execute rule-based go-to preset position on events and patrolling.
   4. The VMS shall pause PTZ patrolling on event and resume patrolling after manual session timeout.
   5. XProtect Corporate shall import PTZ presets defined in the PTZ camera.
   6. The VMS shall rename imported PTZ presets.

X. I/O and events
   1. XProtect Corporate shall support devices with one or more input and output ports.
   2. The Powerful rule processing engine shall execute start and stop actions triggered by events or time profiles.

Y. Setup and management
   1. Download and install the recording server from a web page on the management server. The recording server shall completely managed via the Management Client and configuration changes shall be applied instantly while recording is in operation.
   2. Local recording server configuration data shall be available during periods where the management server is inaccessible.
   3. Recording server manager shall be available in the local console notification area (icon tray) for status messages, start/stop of the service and change of network settings.

Z. Clients shall be authenticated and authorized at the management server and shall use a session-limited access token to access the recording server.

AA. The system shall act as a simple network management protocol (SNMP) agent that can generate an SNMP trap as a result of a rule activation.

AB. Shall enable logging of system, audit and rule entries to the management server with local caching during offline scenarios.

2.04 MANAGEMENT SERVER AND MANAGEMENT CLIENT

A. The Management server shall enable user authentication logon, system configuration and logging.
B. The Management Client shall enable central administration of the system such as recording servers, devices, security, rules and logging.

C. The Management Client shall be compatible with XProtect Corporate and XProtect Expert 2013 and newer.

D. All configuration and logs from the entire system shall be stored in a centralized Microsoft SQL database and accessible by the management server only.

E. The Management server manager shall be available in the local console notification area (icon tray) for status messages and to start/stop the service.

F. The management server shall run as a Windows service under local system account or optional local Windows user or Microsoft active directory account with run-as-a-service privileges.

G. The management client’s graphical user interface shall be available in a minimum of 12 languages including: American English, Chinese (Simplified), Chinese (Traditional), Danish, German, French, Italian, Japanese, Korean, Portuguese (Brazil), Russian and Spanish.

H. The management client’s built-in help shall be available in a minimum of 6 languages including: American English, Chinese (Simplified), French, Japanese, Korean and Portuguese (Brazil).

I. To register and validate your licenses, the system shall offer easy-to-use automatic or manual online activation via the Internet and alternatively, offline activation via email and web for closed surveillance networks.

J. XProtect Corporate shall support both IPv4 and IPv6 addressing. XProtect Corporate shall also be backwards compatible with XProtect 2013 and newer versions.

K. Milestone Interconnect
   1. The System concept shall interconnect all Milestone XProtect video management software (VMS), Milestone Arcus and Milestone Husky units to gain central operation and cost-effective management of geographically dispersed surveillance sites.
   2. Intelligent video storage management shall make optimal use of remote/central video storage and available network bandwidth with a choice to store video recordings remotely, centrally or combined with flexible revival of the remotely stored video.
   3. XProtect Corporate includes the possibility that shall define time interval and bandwidth cap for upload of video from an interconnected site.
   4. XProtect Corporate shall enable the proactive detection of errors and cost-efficient management of connected sites by propagation of system status events and embedded remote management of connected system.
   5. XProtect Corporate has the ability that shall detect system problems and remotely manage interconnected sites reducing operational costs and the need for on-site visits.

L. Milestone Federated Architecture
   1. The system concept that shall enable multiple individual XProtect Corporate and XProtect Expert systems to be interconnected with a central XProtect Corporate system in a hierarchical architecture for infinite scalability and central management.
   2. XProtect Corporate shall support creating a federated hierarchy of sites running XProtect Corporate and XProtect Expert 2013 and newer.
   3. It shall provide centralized management access to all federated sites.
   4. XProtect Corporate includes resilient architecture that shall allow the individual systems to function as autonomous sites in the event of network problems.
   5. The site details (name, address, administrators and additional information) defined in the federated system shall be available in the site navigation.

M. Storage
   1. Allows the definition of one or more storage containers with individual archiving schemes and retention times. The recording capacity shall be limited only by disk space.
   2. Each storage container shall be defined as live database and one or more optional archives, where the video data is moved from the live database to secondary disk systems or network drives. The archived data shall be still online and available for clients.
3. Archiving schemes shall define when video is archived to the next archiving stage in the storage container and how long the video data is retained before deletion.

4. Optional video data grooming possibility shall enable reduction of video recording data size by reducing the frame rate of the video data.

5. The storage functionality shall enable the ability to allocate individual devices to different storage containers.

6. XProtect Corporate shall allow to move a device or a group of devices between two storage containers. The storage functionality shall enable a light and strong video database encryption option, using DES-56 encryption algorithm.

7. Digital signing shall ensure video integrity of video stored in the recording servers.

8. Storage overview shall give instant indication of used vs. available storage in total and for individual cameras.

9. The VMS shall manage maximum recording time for manual recordings.

N. N. Devices

1. The Hardware wizard shall add devices; automatically using Universal Plug and Play (UPnP) discovery, via IP network range scanning, or using manual device detection. All methods support automatic or manual model detection.

2. The Wizard shall enable swift replacement of malfunctioning devices with preserved configuration settings and recordings.

3. The Wizard shall enable easy moving of hardware devices (with attached cameras, microphones, speakers, inputs, outputs and metadata devices) between recording servers in runtime without losing settings, recordings, rules, permissions etc. It shall enable and disable devices if they are not used or are down for maintenance.

4. It shall allow to adjust settings such as brightness, color level, compression, maximum bit rate, resolution and rotation per camera or camera group; select and configure video format, frames per second (FPS), resolution and quality for the video streams used per camera; select and configure one, or more, video streams per camera to be used for live viewing. Each stream can be in different video format, FPS, resolution and quality.

5. XProtect Corporate shall enable adjustable group of pictures (GOP) length for MPEG4, H.264 and H.265 encoded video. It also shall enable assigning camera shortcut number for easy operation by clients and shall provide optional preview window for immediate verification of video settings per camera or for a group of cameras.

6. XProtect Corporate shall allow to define multiple PTZ preset positions on the server, to import PTZ preset positions from cameras and to enable PTZ scanning on supported devices.

7. The VMS shall allow to define multiple PTZ patrolling schemes with adjustable wait time between shifts and customizable transitions with disabling of motion detection to avoid false alarms.

8. The VMS shall allow to run multiple patrolling schedules per camera per day, for example, run different schedules for day/night/weekend.

9. Privacy mask shall consistently hide certain areas in the camera view in live and playback video and in exported material.

10. It shall allow to configure device events like motion detection with pre- and post-buffers, or input signal behavior options and allow to fine-tune motion detection sensitivity per camera manually or automatically.

11. The VMS shall allow to apply one or multiple exclusion zones for where motion detection is to be disabled to avoid unwanted detection.

O. Rules, time profiles and notifications

1. The Powerful Microsoft Outlook®-style rule system shall support an unlimited number of rules.

2. Rule actions shall be triggered by event, time interval or a combination of event and time. Rules shall be optionally stopped by event or after a certain time.

3. Time profiles with reoccurring time selection and expire condition shall support an unlimited number of time profiles.
4. The VMS shall provide a dynamic day-length time profile that follows daylight changes over the year for a given location defined by a GPS position, including daylight savings time. It also shall enable rule-based bookmark creation.

5. The XProtect Corporate VMS system and connected devices shall support a wide set of events that can be used to trigger actions using the rule system. Events shall be grouped in the following categories:
   a. Hardware: events that relate to physical hardware devices connected to the system
   b. Devices: events that relate to certain functions and states of devices available to the XProtect VMS system via the connected hardware devices
   c. External Events: events that relate to VMS integrations
   d. Recording server: events that relate to failover, archiving and database functions.
   e. Analytics: events from integrated applications and systems

6. Start actions: The triggering events may initiate a wide set of actions in the VMS system, connected devices or integrated systems.

7. The VMS shall enable multi-recipient customizable email notification with image and/or AVI attachment of incidents.

P. User rights management

1. User rights management shall enable common and central management of all user rights across all user and programmatic (MIP SDK) interfaces.
2. Overall system security definition shall make it possible to globally allow or deny permission to devices and functions (such as manage, read, edit and delete).
3. Device-specific security definition shall make it possible to allow or deny permission to individual devices and functions (such as manage, read, edit and delete).
4. Tiered management rights shall enable differentiated administrator rights per administrator role.

5. User rights management shall control roles, user and administrator access to:
   a. General: Management Client and XProtect Smart Client profiles, Evidence Lock profile, dual authorization rights, system log-in time profile
   b. Cameras: visibility, administrate, live view (within time profile), playback (within time profile), search sequences, export, smart search, AUX commands, manual recording, bookmark functions, Evidence Lock functions
   c. Microphones and speakers: visibility, administrate, listen to live audio (within time profile), playback audio (within time profile), search sequences, export, manual recording, bookmark functions, Evidence Lock functions, speak to speakers
   d. Inputs and outputs: visibility, administrate, status, activation
   e. PTZ: manual control, activate PTZ presets, PTZ priority, manage PTZ presets and patrolling, lock/unlock PTZ presets, reserve and release PTZ session
   f. Remote recordings: retrieve remote recordings
   g. XProtect Smart Wall: visibility, administrate, control, playback
   h. External events: visibility, administrate, trigger
   i. View groups privileges: Servers: XProtect® Enterprise server access and authentication details, Milestone Federated Architecture site permissions
   j. Alarms: visibility of alarms and ability to manage alarms
   k. MIP: Plug-in permissions
   l. Application: manager, XProtect Smart Client/XProtect Web Client/Milestone Mobile, live/ playback/setup, status API and service registration API

Q. Evidence Lock shall manage retention time options and shall provide overview of locked video sequences.

R. Logs of system, audit and rule entries shall consolidate from all recording servers and clients. Each log file shall have adjustable size and time limitations.

S. Management Client profiles

1. Centralized management of Management Client application options shall enable optimization of the Management Client for different user categories and skill levels.
2. Management Client profiles shall enable the ability to tailor the availability of main/sub functions in the Management Client for different user roles.

T. XProtect Smart Client profiles
1. Centralized management of XProtect Smart Client application options shall enable optimization of XProtect Smart Client for different user categories and skill levels.
2. Smart Client profiles shall enable ability to enforce or recommend optional XProtect Smart Client application options for a user or group of users, using an unlimited number of XProtect Smart Client profiles.
3. Profiles shall enable defining general XProtect Smart Client application options, including (listing not exhaustive): visibility of time, visibility of camera live indicators, default image quality, default frame rate, keyboard and joystick setup, startup mode and de-interlacing filters.
4. XProtect Smart Client profiles also shall:
   a. Provide access to live mode and the availability of individual control panes and overlay buttons
   b. Shall provide access to playback mode and the availability of individual control panes, overlay buttons and settings for specific functions, such as default export path
   c. Provide access to setup mode and the availability of individual control panes and setup functions
   d. Provide access to Sequence Explorer, Alarm Manager, System Monitor
   e. Provide access to setup mode and the availability of individual control panes and setup functions
   f. Define available view layouts

U. System administration
1. System administration shall include built-in backup and restore support for manual system backup of all configuration data, including (listing not exhaustive): system configuration data, maps/Smart Maps, alarm settings and definitions and client views.
2. The system monitor with customizable dashboard shall enable task or component specific live monitoring.
3. System administration shall enable historic performance and usage investigation and reports of; storage usage, network use, server and camera performance.
4. The system monitor shall enable customizable Normal, Warning and Critical system monitor and event triggers for; CPU and Memory usage on servers, used space, recording and live FPS on cameras, free space on disks and predicated retention time for storage definitions.
5. Configuration Reporting shall enable complete or partial documentation of system configuration. Custom and site-specific free-text information, integrator’s notes and logo can be added to the printer-friendly reports.

V. License administration
1. License overview shall include add-on products, Milestone Care coverage and renewal date. The License owner information shall synchronize with the software registration page on the Milestone website.
2. License administration shall provide expanded license information for multi-site installations where both the total used licenses for the common SLC is presented and the license use in the specific system. It shall provide license overview that presents the license use of all the individual sites running on the same SLC.
3. The “Changes without activation” function shall allow additions and replacements of limited number of devices without requiring license activation.

W. Authentication
1. System log-in shall use Microsoft Active Directory, local Windows or basic user account. Hereby, current windows logon shall be used for authentication.
2. Dual authorization shall offer an optional additional level of system security, where Management Client users are granted access to the system only when a second user or supervisor has confirmed the log-in with a successful authorization of the second user.
2.05 EVENT SERVER

A. The alarm manager shall manage single-point alarm management of all internal system alarms and external security alarms. It shall provide alarm descriptions and work instructions to make alarms actionable for operators.

B. An alarm location map shall be linked to each alarm providing instant situational awareness to the operator dealing with the alarm.

C. Customizable alarm priorities shall allow operators to focus on the most critical alarms and shall enable logical grouping of alarms dependent on their type and nature.

D. Customizable alarm statuses shall enable alignment of the alarm handling workflow with existing workflows and security systems.

E. The alarm handling result code shall enable tracking of the outcome of the alarms.

F. The alarm manager shall enable automatic allocation to alarm owner with escalation and alarm forwarding possibilities.

G. The alarm manager shall enable time profiles for definition of active alarms. It shall provide the possibility to associate one or more cameras to an alarm (maximum 15 cameras can be displayed simultaneously in the alarm preview window).

H. A set of alarm handling reports shall give valuable information about alarm inflow and alarm handling performance.

I. The alarm manager shall enable extensive logging of alarms.

J. Microsoft Clustering shall support the event server enables secure and redundant alarm handling.

2.06 MILESTONE MOBILE SERVER

A. The Milestone Mobile server shall run as a dedicated service, allowing it to be installed either on the same server as other system components or on dedicated hardware in more demanding installations.

B. The Milestone Mobile server shall transcode video so streams are robust and can adapt to changing connection bandwidth. The server also optimizes the use of available bandwidth to get the best possible stream quality.

C. Adjustable transcoding logic shall enable capping of video resolution and frame rate for video streams provided to XProtect Web Clients and Milestone Mobile clients.

D. The server shall provide option to bypass the transcoding logic and send direct streams to XProtect Web Clients.

E. Installing the Milestone Mobile server plugin in the Management Client shall give access to Milestone Mobile server management in order to change settings, read out miscellaneous status information, configure codecs used for exports as well as manage ongoing and completed exports.

F. Milestone Mobile servers shall be installed in parallel, offering redundancy and/or allowing more simultaneous users.

G. Milestone Mobile servers shall be configured through the tray controller to easily adjust or update settings. Shall provide option to either a default-generated certificate for HTTPS encrypting the connection to the Milestone Mobile server or provide your own custom certificate.

H. Video Push configuration shall be done from the server, so users can download and use Milestone Mobile without having to do any configuration.

I. Milestone Mobile server shall support creating server-side export through XProtect Web Client and Milestone Mobile.

J. XProtect Web Client, including optional browser plug-ins, shall be included with the Milestone Mobile server. No additional setup is needed.
K. Smart Connect shall enable easy configuration of internet access to the Mobile Server by automatic configuration of firewalls and internet routers via UPnP. Smart Connect shall also verify the configuration and operation of the internet connection, and can be used to email connection details to Mobile Client users.

2.07 XPRESS SMART CLIENT

A. General
1. XPRESS Smart Client shall provide dedicated task-oriented tabs for the Sequence Explorer, Alarm Manager and System Monitor, in addition to the traditional Live and Playback tabs.
2. The client shall provide application theme support with choice of dark or light themes.
3. XPRESS Smart Client shall provide true multi-window support where secondary windows have full functionality and can be operated in independent mode or synchronized mode where they follow the control of the main window.
4. It shall enable shortcuts to select a specific window or specific camera in a window.
5. The client shall provide a camera search function that promptly finds cameras, types of cameras and views in the system with the ability to create temporary views to display all or a subset of cameras matching the search criteria.
6. XPRESS Smart Client shall display metadata bounding boxes from supported devices in live views and playback.

B. Customization
1. The application options shall enable customization of the general behavior and look of the XPRESS Smart Client. The customization shall be able to either be made as individual personalization managed by each operator, or centrally enforced using Smart Client Profiles.
2. The application shall offer a simplified user interface with the possibility option to toggle between “Simple” and “Advanced” modes, where Advanced mode is default.
3. The XPRESS Smart Client shall enable control of general look & feel and navigation properties, such as color mode, camera title bar, grid sizes etc.
4. The client shall provide the availability of control panes and functions in live and playback tabs, and in setup mode, as well as the behavior and availability of the expert function.
5. The application shall allow to include information in time line in the playback tab, setup keyboard short cuts and joystick controls, as well as specific behavior of alarms and access control notifications.

C. The XPRESS Smart Client shall include advanced application settings such as use of multicast, hardware acceleration, videos diagnostics overlay and time zone settings.

D. Live view
1. XPRESS Smart Client shall enable to view live video from 1-100 cameras per computer monitor/view. Multiple computer monitor support shall provide a main window and any number of either floating windows or full screen views.
2. Live view digital zoom shall allow a full view of recordings while the operator can digitally zoom in to see details.
3. Live view shall support multiple view layouts optimized for 4:3 and 16:9 display settings in both landscape and portrait.
4. Independent playback capability shall allow for instant playback of recorded video for one or more cameras, while in live mode.
5. Centralized storage of shared and private camera views, shall enable coherent access to views across the system.
6. Live view provide possibility to instantly re-arrange cameras in views for optimized monitoring of incidents, with single click restore of original view.
7. It shall provide seamless access to cameras in interconnected and federated systems.
8. Live view shall enable instant camera placement in live view allows for instant replacement of cameras in a view, where new cameras can be placed in a particular view and positioned through a simple drag-and drop operation.
9. Live view shall update on “motion only” optimizes CPU use by allowing motion detection to control whether or not the image should be decoded and displayed.

10. Global hotspot function shall allow users to work in detail with any camera selected from any view. Local hotspot function shall allow users to work in detail with a camera selected from the same view.

11. Carousel function shall allow a specific view item to rotate between pre-defined cameras that are not necessarily present in the view at the same time. Operators shall select default or custom display times for each camera, and they are able to manually switch to the next or previous camera in the carousel list.

12. Matrix function shall show live video from multiple cameras in any view layout with customizable rotation paths, remotely controlled by computers sending matrix remote commands.

13. Live view shall import static or active HTML maps for fast navigation to cameras and to provide a good overview of premises.


15. Live view shall activate matrix via graphical maps of premises using JavaScript or integrate with centralized access control systems.

16. It shall allow the operator can assign outputs, PTZ presets and views as actions to joystick buttons and as keyboard shortcuts.

17. Two-way audio support shall enable XProtect Smart Client to record and play live audio from camera- connected microphones and outgoing audio from the operator’s microphone to one or multiple camera speakers.

18. Live view shall enable adaptive de-interlacing option secures high video quality, based on the actual video content received. XProtect Smart Client shall optionally apply a filter to areas of the image where jagged edges would otherwise show up.

19. Operators shall start/stop manual recording on individual cameras, where the recording status is propagated to all XProtect Smart Client users active in the system.

E. E. Pan Tilt Zoom

1. Control PTZ cameras by using;
   a. PTZ preset positions
   b. PTZ point-and-click control
   c. Overlay buttons
   d. PTZ zoom to a defined rectangle
   e. Video overlaid PTZ control
   f. Virtual joystick function
   g. Joystick
   h. Manage PTZ presets and patrolling profiles
      i. Start, stop and pause patrolling
      j. View who have PTZ control and time to automatic release
      k. Lock PTZ control
   l. 360° ImmerVision Enables® Panomorph lens technology

2. Live view shall enable to take manual control of a PTZ camera that is running a patrolling scheme. After a timeout with no activity, the camera reverts to its scheduled patrolling scheme.

F. I/O and events

1. Overlay buttons shall provide intuitive control of cameras, camera-integrated devices and other integrated systems directly from the camera view.

2. I/O and events shall enable to manually trigger output port relay operation, for example when controlling gates.

3. I/O and events shall enable to manually trigger events by activating a server-defined event from a list.

G. Bookmarking

1. Bookmarking shall enable to manually define quick or detailed bookmarks with the bookmark function. It shall enable to create bookmarks based on rules.
2. Bookmarks shall be shown in timeline with instant preview.
3. The function shall enable to listen and preview bookmarks in recording search.
4. Bookmark reports shall enable effortless incident documentation.
5. Direct video export of a bookmark shall reduce the time needed to prepare forensic video material.

H. Playback
1. Playback shall provide playback video from 1-100 cameras per computer monitor/view.
2. Advanced video navigation shall include fast/slow playback, jump to date/time, single step and video motion search.
3. Playback shall include integrated video timeline with time navigation and playback controls, including an integrated function to select a time interval for export, Evidence Lock or video retrieval from Edge Storage devices and interconnected systems.
4. Playback shall allow to toggle between simple and advanced timeline mode.
5. Playback shall allow to toggle between simple and advanced timeline mode.
6. Independent playback capability shall allow the independent playback of recorded video from one or more cameras.
7. Instant camera placement in playback view shall allow users to instantly replace cameras in a view, where a new camera can be placed in a particular view and position with a simple drag-and drop operation.
8. Digital zoom shall allow the operator to see magnified details in the recorded video.

I. Export and print
1. The snapshot function shall enable operators to produce instant visual documentation of a camera by saving the camera image to a file, or sending it directly to a printer.
2. The storyboarding function shall make it possible to include video sequences from different or overlapping time intervals form different cameras in the one and the same export.
3. The export and print function shall provide export in XProtect format; including the standalone XProtect Smart Client - Player application for instant and easy viewing by authorities.
4. The function shall allow export preview with looped playback.
5. Export and print shall enable encryption and password protection of exported video material with a choice of following strong encryption algorithms: 56-bit DES 128, 192 and 256-bit AES.
6. Secure video evidence handling with a digital signature of exported video material that shall enable users to verify the video has not been modified or tampered with when viewing the export in the XProtect Smart Client - Player.
7. Export and print shall allow to create evidence material in media player format (AVI files), MKV format, or still image format (JPEG images).
8. The function shall allow to disable re-export option to prevent undesirable distribution of sensitive evidence material.
9. Export and print shall allow to bulk camera export in multiple formats to multiple destinations, including direct export to optical media, results in more efficient video exports and more secure handling of evidence material.
10. Export comment function shall enable users to add general and/or camera-specific comments to a video export when exporting to XProtect format.
11. In media player format comments shall be added as pre/post slides.
12. The VMS shall allow to print incident reports including image, surveillance details and free-text user comments.

J. Sequence Explorer
1. The smart client shall include dedicated tab for the Sequence Explorer.
2. The search options shall be: recording sequences (with support for time slicing), bookmarks and Smart Search.
3. The sequence explorer shall include smooth navigation with sliding preview and “drag-and-throw” function for video thumbnails.
4. The VMS shall include preview of selected sequence with auto play and direct export support.

K. Evidence Lock
1. Evidence lock shall allow manual extension of video retention time for a selected set of cameras in a given time interval, where the operator selects an extended retention time from a pre-defined set of retention time options.
2. Evidence Lock shall override defined retention and grooming policies
3. Headline and details information shall be added to locked video sequences in order to enhance the manageability.
4. Search, filter and listing functions shall provide an overview of locked video and allows XProtect Smart Client users to manage locked evidence, including editing comments, modifying the extended retention time and removing the Evidence Lock.
5. Locked video can be exported though a single step operation.

L. Map function
1. Built-in map function in XProtect Smart Client shall provide intuitive overview of the system and offers integrated access to all system components.
2. Map images shall be in standard graphic file formats including JPG, GIF, PNG and TIF.
3. Map function shall include any number of layered maps such as city, street, building and room.
4. The function shall enable instant camera preview on “mouse over” and one-click shows all cameras on map.
5. Map function shall provide one-click function to open floating window with all cameras (maximum 25 cameras) on the map.
6. The function shall allow depiction of camera view zones on map with clickable PTZ zones for instant PTZ control.
8. The function shall provide integrated control of speakers, microphones, and events and output I/O control, including: doors, gates, light and access control systems.
9. Map function shall also:
   a. Provide real-time status monitoring indication from all system components including cameras, I/O devices and system servers
   b. Provide graphical visualization of the system status through color coding
   c. Provide hierarchical propagation of status indications to higher ordered maps
   d. Make different levels of status indications available (alarm, warning and errors)
   e. Provide system performance data for cameras and servers including camera resolution, FPS, network use and disk space
   f. Be able to suppress status indications (such as error and warning) for a given device
   g. Provide the possibility to edit device names in a map and assign map-specific names and references to devices in a map
   h. Map editing subject to user rights

M. Smart Map function
1. Map function that shall provide seamless geo-navigation, with seamless drilldown across different layers.
2. The functionality shall support:
   a. Bing, Google and OpenStreetMap map services
   b. Geo-referenced GIS maps (shapefiles)
   c. Geo-referenced CAD drawings (dwg and dxf files)
3. Smart Maps shall also enable the ability for users to toggle different layers on and off in the map.
   a. Examples of such layers are cameras (names, view of field, name), quick links and different layers provided by the maps and drawings used (street names, buildings, etc.).
4. Location links shall enable quick navigation across different sites and locations. Map links shall enable drilldown to existing classic XProtect Smart Client maps.

5. Additionally, the Smart Map function shall support:
   a. Instant one-click camera preview
   b. Easy multi-camera selection with camera preview
   c. Easy drag-and-drop and point-and-click definition of: cameras, camera field of view, location links and quick links
   d. Selection of 10 different camera icons
   e. Depiction of camera field of view on map

6. It shall include the possibility to edit device names in a map and assign map-specific names and references to devices in a map. Camera object aggregation shall preserve the overview when several cameras are closely located.

N. Camera Navigator
   1. The camera navigator shall provide consistent and comprehensive visual verification, ensuring easier tracking of moving objects in geographically complex environments.
   2. The navigator shall automatically display thumbnail views of nearby cameras.
   3. The camera navigator shall provide add-on to the map application with no special configuration needed.

O. Alarm Manager
   1. The Smart Client shall provide dedicated dockable tab for the Alarm Manager.
   2. The alarm manager shall include alarm list with extensive filtering capabilities and an alarm preview in both live and playback mode.
   3. The alarm manager shall enable extensive alarm sort and filtering functions allow operators to focus on most critical alarms.
   4. Instant preview of primary and related cameras shall reduce the number of false alarms.
   5. Tight integration with the map function shall allow operators to indicate and acknowledge active alarms in the map.
   6. Alarm descriptions and work instructions shall make alarms actionable for operators.
   7. Alarm escalation and alarm forwarding possibilities shall allow operators with appropriate skills to handle different alarms.
   8. Alarm reports shall enable incident documentation.
   9. Alarm location map shall present the alarm operator with a map showing the alarm area when an alarm is selected.
   10. The alarm manager shall provide alarm notification to a single or a groups of Milestone Mobile client users using Push Notifications.
   11. The manager shall provide optional sound notifications for different alarm priorities for notification of new incoming alarm.
   12. Alarm disabling option shall enable users to suppress alarms from a given device in a certain time period.
   13. The alarm manager shall enable instant access to both live and recorded video from the cameras that are related to the alarm.
   14. Alarm handling reports shall give valuable information about alarm inflow and alarm handling performance.
   15. The manager shall provide common alarm list for all interconnected sites.
   16. The alarm manager shall provide global common alarm list for all sites in a Milestone Federated Architecture.

P. System Monitor
   1. The system monitor shall provide dedicated dockable tab with system performance and use information. It shall provide dashboard for task or component specific live monitoring.
   2. The system monitor shall provide historic performance and usage investigation and reports of: storage usage, network use, server and camera performance.

Q. Setup and management
   1. Download and install XProtect Smart Client from a web page on the management server. It shall enable notification about new updates at log-in.
2. Application options shall allow users to adapt the layout and personalize the application to their particular preferences.

R. Authentication
1. System log-in shall use Microsoft Active Directory, local Windows or a basic user account. Furthermore, it shall use current Windows logon for authentication, and use Auto-log-in and auto-restore views.
2. Dual authorization shall offer an optional additional level of system security, where XProtect Smart Client users are granted access to the system only when a second user or supervisor has confirmed the log-in with a successful authorization of the second user.

S. System
1. The system shall support for IPv4 and IPv6 addressing.
2. The 64-bit Windows® operating system support shall enable better performance when viewing and operating many cameras.
3. The system shall support multicast streams.
4. It shall support for hardware accelerated decoding using Intel Quick Sync video.

T. XProtect Smart Client - Player
1. XProtect Smart Client - Player shall be able to play back recorded or archived video and audio evidence, including edited storyboard exports.
2. The player shall include same user-friendly interface and most functions as XProtect Smart Client.
3. The player shall offer a simplified user interface with the possibility option to toggle between “Simple” and “Advanced” modes.
4. It shall provide instant one-click playback for easy viewing of exported video evidence.
5. Advanced second-level investigation tools shall make it easy to refine exported video and re-export the most essential evidence.
6. Metadata bounding boxes included in exports shall be displayed time synchronized in XProtect Smart Client - Player.
7. The project tool shall allow users to merge video exports or archives from two different locations or XProtect systems together into one new export.
8. The XProtect Smart Client - Player shall also:
   a. Provide view up to 100 cameras time-synched during playback
   b. Provide camera search function promptly finds cameras, types of cameras and camera views in the system
   c. Provide scrollable activity timeline with magnifying feature
   d. Provide instant search on recordings based on date/time and activity/alarm (video motion detection)
   e. Shall allow to view, modify or add general and/or camera-specific comments for a given video export
   f. Shall allow de-interlacing of video from analog cameras
   g. Shall support 360° ImmerVision Enables® panomorph lens technology
9. Evidence shall be generated as a printed report, a JPEG image, an AVI or MKV film or in XProtect format. Shall include export audio recordings in WAV, MKV or AVI format.
10. Exported video shall be digitally zoomed to view an area of interest and minimize export footprint size.
11. The player shall enable re-export evidence containing XProtect format and XProtect Smart Client - Player for instant, easy viewing by authorities.
12. Verification of digital signatures added in the recording server, or as a part of the export, shall enable users to verify that the video has not been modified or tampered with.
13. The player shall provide encryption and password protection of exported video material with a choice of the following strong encryption algorithms: 56-bit DES 128, 192 and 256-bit AES.
14. Secure video evidence handling with a digital signature of re-exported video material shall enable users to verify that the video has not been modified or tampered with when viewing the export in XProtect Smart Client - Player.
U. XProtect Web Client
1. XProtect views shall be accessed through the browser and avoid advanced setup.
2. Shared views shall be managed centrally via the server with administrator/user rights and user groups.
3. Camera search function shall promptly find cameras, types of cameras and camera views in the system.
4. The client shall include:
   a. Easy multi camera video playback including fast/slow playback, single frame step and jump to date/time with frame preview while adjusting time.
   b. Investigation function with ability to save exports for later usage or download
   c. Option for client-side video decoding via browser plug-ins
   d. Control PTZ cameras remotely, including preset positions
   e. Dynamic bandwidth optimization when streaming from server to client gives better use of bandwidth
   f. Create AVI files or save JPEG images
   g. Preview exports on the server without downloading them
   h. Trigger outputs and events with live view of related camera
   i. System log-in using XProtect user name and password
   j. System log-in using Microsoft Active Directory user
   k. Secure connection through HTTPS
5. The XProtect Web Client shall allow to export on the server to avoid moving large video files back and forth. The client shall allow to only download needed files or save them for downloading when on a faster connection.
6. There shall no installation be needed on client computer.

2.08 MILESTONE MOBILE
A. General
1. Milestone mobile shall support any mobile device running Android® 2.2, iOS5, and Windows® Phone 8, or newer versions.
2. Add log-in credentials for multiple servers in Milestone Mobile shall allow to easily switch between sites or different connection addresses.
3. Views shall be inherited from the connected XProtect VMS system. The client shall automatically obtain the user’s private and shared views from the system to be used as camera lists in Milestone Mobile.
4. A view with all cameras shall be automatically generated, allowing Milestone Mobile to be used when no views are set up. It shall also provide a quick way of searching through cameras.
5. Camera search function shall promptly find cameras, types of cameras and camera views in the system.
6. Cameras shall be viewed in full screen to take better advantage of the device’s screen. It is also possible to search through cameras in a view while in full screen by swiping left or right.
7. Digital pinch-to-zoom shall enable users to zoom in on a part of the image for closer review and conduct detailed investigation of video when using megapixel or high-definition cameras.
8. Milestone Mobile shall allow to play back recordings from the database and select a specific time or recorded sequence to start playback, step through recordings and select a playback speed.
9. Milestone Mobile shall allow to view recordings from the database while keeping an eye on what is currently happening. The client shall display a live picture-in-picture frame of the same camera when in playback mode. The picture-in-picture shall be moved by dragging and double-tapping and will return to live view.
10. Control over the PTZ cameras shall be given with Milestone Mobile either manually or by selecting predefined presets for quick navigation.
11. Video Push shall allow users to use their mobile devices’ cameras as cameras in the XProtect VMS. It is easy to use and requires no setup in the mobile device.
12. Milestone Mobile shall include the option to include location metadata in Video Push.

B. Trigger outputs and events
1. Mobile devices shall trigger outputs connected to the XProtect VMS, or user-defined events to have greater control while on the go.
2. Milestone Mobile shall allow to connect securely to the Milestone Mobile server using HTTPS encryption.
3. The VMS shall allow to export on the server to avoid moving large video files back and forth. Milestone Mobile shall allow to only download needed files or save them for downloading when on a faster connection.
4. Milestone Mobile shall enable alarm notifications using Push Notifications, notifications include access to video, alarm information and instructions.
5. Smart Connect with automatic Mobile Server discovery on LAN using UPnP, and easy connection via WAN shall enable to know Mobile servers without having to keep track of actual server addresses.
6. It includes an investigation function that shall access investigations done in the Web client.

2.09 SMART WALL
A. System
1. The system shall be hardware independent and run on standard servers and displays. No special video wall hardware or network configurations shall be required.
2. The system shall be flexible and scalable, support multiple XProtect Smart Walls with an unlimited number and combination of monitors at any location.

B. Management
1. Management of XProtect Smart Wall shall be fully integrated with the Management Client.
2. Intuitive XProtect Smart Wall builder shall enable easy definition of any number of XProtect Smart Walls, including the size and position of individual monitors.
3. XProtect Smart Wall presets shall provide powerful control of the layout (camera grid) and camera content.
4. All user actions shall be subject to the assignment of user rights.

C. Control
1. Dynamic user control of XProtect Smart Wall layout and content shall be enabled through manual drag- and-drop of items from XProtect Smart Client - including; views, cameras, hotspots, carousels, maps, Smart Maps, still images, http pages, alarms, texts, bookmarks (bookmark image or looped bookmark playback) and system monitor.
2. The function shall be enabled by automatic event-driven control of XProtect Smart Wall layout and content based on rules, such as motion detection, I/O, integrated third-party applications, time, or video analytics events.
3. Layout control shall enable instant insertion of a camera in a specific monitor and position, changes of XProtect Smart Wall monitor layout, setting of all (or some) of the monitors in XProtect Smart Wall to a predefined layout and set of camera feeds
4. Intuitive integration with the map function shall enable users to easily drag-and-drop cameras into XProtect Smart Wall from the map.
5. The control function shall support seamless manual or rule-based display of any camera in a distributed setup based on Milestone Federated Architecture or Milestone Interconnect.
6. The control function shall enable interactive and remote controlled playback of recordings on the XProtect Smart Wall.

D. View
1. Individual XProtect Smart Client users shall view XProtect Smart Wall views as a part of the available view selection, which enables XProtect Smart Wall to be used as an operator collaboration tool.

2.10 LICENSING STRUCTURE
A. Server base license
1. An XProtect Corporate server base license is mandatory for installing the product.
2. The base server license permits the following deployments within the legal entity purchasing the base server license:
   a. Unlimited number of Management Servers
   b. Unlimited number of Recording Servers
   c. Unlimited number of XProtect Smart Clients, XProtect Web Clients and Milestone Mobile applications

B. Hardware device license
1. To connect cameras, audio devices, video encoders and other devices to XProtect Corporate, one license per physical hardware devices required.
2. In total, for all copies of the product installed under this license, the product may only be used with hardware devices as you have purchased hardware device licenses for.
3. An unlimited number of hardware device licenses can be purchased. To extend an installation with additional hardware device licenses, the base server license number (SLC) is required when ordering.

C. Licensing of Milestone Interconnect
1. One Milestone Interconnect device license is required per device (camera) in an interconnected site that is enabled in the central XProtect Corporate system.

D. Licensing of Milestone Federated Architecture
1. The use of Milestone Federated Architecture is free and not subject to licensing. This implies that unlimited sites and cameras can be included in the federated hierarchy, without the need for additional or special licenses.

E. XProtect Smart Wall application license
1. XProtect Smart Wall is an add-on product that is included in the base license of XProtect Corporate 2016 R3, which permits connection of unlimited numbers of XProtect Smart Walls (including physical displays) and camera feeds.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING
A. Handle and operate products and systems according to the manufacturer’s instructions.
B. Deliver materials in manufacturer’s original, unopened, undamaged containers with original identification labels.
C. Protect stored materials from environmental and temperature conditions following the manufacturer’s instructions.

3.02 INSTALLATION
A. The Integrator’s project manager and lead technicians within the project shall carry proper certification issued by the manufacturer and provide recent certifications to confirm sufficient product and technology knowledge.
B. The Integrator shall follow the installation instructions provided by the manufacturer to ensure the system is designed, calculated and installed per the manufacturer recommendations.
C. The database shall be reviewed by the Owner and approved before the Integrator enters it into the system.
D. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to testing and training of the owner.
E. All firmware in products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the Video Management System to ensure approved integration compatibility.
F. A proper installation shall meet NEC per the guidelines of that year’s revision and the local authority having jurisdiction. When properly installed equipment meets Low Voltage, Class 2 classification of the NEC.
G. Milestone Corporate shall be fully integrated into S2 Security Management System.
1. Milestone integrator must also be S2 System Certified.

3.03 TESTING

A. The Integrator shall demonstrate the functionality of the VMS upon completion of installation, documenting the result of all tests and providing these results to the Owner.

   1. The VMS shall be tested in accordance with the following:
      a. The Integrator shall be responsible for documenting and entering the initial database into the system debugging all issues. Prior to full operation, a complete demonstration of the computer real-time functions shall be performed. A printed validation log shall be provided as proof of operation for each software application package. In addition, a point utilization report shall be furnished listing each point.
      b. Upon satisfactory on-line operation of the system software, the entire installation including all subsystems shall be field inspected. Each device shall be tested as a working component of the completed system. All system controls shall be inspected for proper operation and response.
      c. Tests shall demonstrate the response time and display format of each different type of input sensor and output control device. Response time shall be measured and documented with the system functioning at full capacity. Computer operation shall be tested with the complete data file.
      d. The Integrator shall maintain a complete log of all inspections and tests. Upon final completion of system tests, a copy of the log records shall be submitted as part of the as-built manuals along with a letter of certification to indicate that the tests have been performed, and all devices are operational.
      e. The completed system shall be tested in front of the owner or owner’s agent. The system test shall be witnessed by the Authority Having Jurisdiction if necessary. Any deficiencies noted during the testing must be corrected.

3.04 MAINTENANCE

A. Installing integrator shall maintain proper manufactures certification and training during the warranty period. The availability of expansion, replacement and spare parts shall be accessible during the warranty period at standard pricing.

B. User training for multiple shifts shall be available at the time of acceptance at the owners location. Additional user e-training shall be available from the manufacturer during the warranty and license periods.

C. Hard and electronic copies of installation, maintenance and operations manuals shall be provided at the time of acceptance. As-Built drawings are also to be provided at this time.

END OF SECTION 28 20 13
### DOOR AND FRAME SCHEDULE - AST

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Finish</th>
<th>Location</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>D1</td>
<td>Steel Door</td>
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<tr>
<td>D2</td>
<td>Glass Door</td>
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<td>Lobby</td>
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### DOOR ACCESS CONTROL SCHEDULE - AST

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<td>A3</td>
<td>Auditorium</td>
<td>Key Card Access</td>
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### DOOR AND FRAME SCHEDULE - BHS

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By: [Company Name]

Date: [Current Date]

Project: [Project Name]

Details: [Project Details]
### Door and Frame Schedule - SRC

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<tr>
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### Door Access Control Schedule - SRC

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### Door and Frame Schedule - SSS

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### Experimentation Group (ETG)

Type: Data Analysis

- Data Set: Door and Frame Schedules
- Analysis: Comparative Study of Door Access Security

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**ETG Central Community College**

Due to confidentiality, precise details are not disclosed.

**Board Submittal**

- Project Number: G3.4

---

**Engineering Technologies Inc.**

- Contact: info@eti.com

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**CAMPUS SAFETY PROJECT**

- Objective: Enhancing Security Measures
- Implementation: Enhanced Biometric Access Controls
**Door and Frame Schedule**

<table>
<thead>
<tr>
<th>Door Type</th>
<th>Frame Type</th>
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**Door Access Control Schedule**

<table>
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**Diagram**

- [Diagram Image]

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**Board Submittal**

- [Board Image]

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**Engineer's Note**

- [Note Image]
## Door and Frame Schedule - BCL

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## Door Access Control Schedule - BCL

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## Door and Frame Schedule - MSC

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## Door Access Control Schedule - MSC

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**Notes:**
- All materials and finishes are subject to change.
- Locations are approximate and subject to final placement.
- All schedules are preliminary and require approval by the project manager.
### Door and Frame Schedule - Dorm 08

<table>
<thead>
<tr>
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### Door Access Control Schedule - Dorm 08

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### Door and Frame Schedule - Dorm 14

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### Door Access Control Schedule - Dorm 14

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### Door Access Control Schedule - Dorm 15

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CHAPTER: Freedom of Expression – Public Forum Policy

DATE ADOPTED: May 10, 2016

NUMBER: 224

SYNOPSIS:

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<tr>
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<td>Designated Areas</td>
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<tr>
<td>3</td>
<td>Types of Use</td>
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<tr>
<td>4</td>
<td>Applications for Scheduled Use</td>
</tr>
<tr>
<td>5</td>
<td>Other Restrictions</td>
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</table>

1. **Institutional Regulations:** Iowa Central Community College seeks to foster and sustain a forum for the free, civil and orderly exchange of ideas, values and opinions, recognizing that individuals grow and learn when respectively confronted with differing views, alternative ways of thinking and conflicting values.

   This procedure identifies outdoor areas on the ICCC campus where individuals can exercise their freedom of expression, peaceful assembly and petitions to authority and guidance so that the exercise of these freedoms does not interfere with the operation of the College or the rights of others. These regulations shall be applied on a neutral basis without regard to the content or viewpoint of the particular expression involved.

   This Freedom of Expression – Public Forum – Policy is adopted consistent with Iowa Code Section 261H.2 and the following principles are adopted as part of this policy:

   1. That the primary function of an institution of higher education is the discovery, improvement, transmission, and dissemination of knowledge by means of research, teaching, discussion, and debate. This statement shall provide that, to fulfill this function, the institution must strive to ensure the fullest degree of intellectual freedom and free expression allowed under the first amendment to the Constitution of the United States.

   2. a. That it is not the proper role of an institution of higher education to shield individuals from speech protected by the first amendment to the Constitution of the United States, which may include ideas and opinions the individual finds unwelcome, disagreeable, or even offensive.

   b. That it is the proper role of an institution of higher education to encourage diversity of thoughts, ideas, and opinions and to encourage, within the bounds of the first amendment to the Constitution of the United States, the peaceful, respectful, and safe exercise of first amendment rights.

   3. That students and faculty have the freedom to discuss any problem that presents itself, assemble, and engage in spontaneous expressive activity on campus, within the bounds of established principles of the first amendment to the Constitution of the United States, and subject to reasonable time, place, and manner restrictions that are consistent with established first amendment principles.

   4. That the outdoor areas of campus of an institution of higher education are public forums, open on the same terms to any invited speaker subject to reasonable time, place, and manner restrictions that are consistent with established principles of the first amendment to the Constitution of the United States.

2. **Designated Areas:** The College may regulate the time, place, and manner of expressive non-commercial speech and activity which occurs within the areas designated by this procedure.

   College staff will work with individuals and groups to find reasonable locations that do not:

   a. Block, or in any way interfere with or impede any other person’s entrance to or exit from or through any sidewalk, roadway, or doorway on campus.
### Types of Use:

**a. Casual Use** – Casual use means any spontaneous and unorganized non-commercial use for which there is no prior promotion, solicitation, or purposeful attempt to attract or solicit the public.

1. Individual students and other persons may use the designated areas for any casual non-commercial and reasonable use during the times described in Section 5.

2. Casual users are not permitted to use any electronic sound amplification system or equipment that might disrupt class or other activities.

3. Casual users may not interfere with the use of any of the designated areas by authorized groups or unreasonably disturb or disrupt persons in adjacent buildings, and such users are expected not to damage or destroy any College property (including grass or shrubbery) or cause any litter. They will be held responsible for the cost of any damages or repairs.

**b. Scheduled Use by Eligible Groups** – The College recognized student organizations and other groups or individuals which are eligible to use College facilities may reserve and use the designated areas for public meetings, rallies, teach-ins, convocations, festivals, and other authorized events and activities during the times described in Section 5. Requests for such use shall be submitted as described in Section 4.

### Applications for Scheduled Use:

**a. Eligible groups shall make a request to use the designated areas by submitting a completed application form to the Vice President of Enrollment Management and Student Development office.**

**b. Applications should be submitted at least three (3) business days in advance of the intended use to provide time for all necessary arrangements. However, reasonable effort will be made to accommodate requests made at least one business day (24-hours) in advance of a requested event.**

**c. College officials will provide a response to the application within one (1) business day from when the application is received. Requests shall be granted on a space available basis. Written approval must be obtained by the eligible group prior to using the designated area.**

**d. Eligible groups using the designated areas may not unreasonably disturb or disrupt persons in adjacent buildings, and such groups are expected not to damage or destroy any College property (including grass or shrubbery) or cause any litter. If security is required, or the College Administration deems it necessary to make adequate security arrangements for traffic or crowd control, arrangements will be made through the College.**

**e. All federal and state laws and city ordinances must be obeyed, and it is the responsibility of the group to obtain all applicable permits or licenses.**

**f. This policy does not affect the practice of conducting outdoor classes by College faculty or staff.**

### Other Restrictions:

**a. Hours of Use** – Casual use is normally permitted at any time except as specifically prohibited or restricted. Scheduled use is normally restricted to the hours of 7:30 a.m. to 8:00 p.m., Monday through Friday.

**b. Camping on College property is prohibited.**
c. No device or structure shall be placed or erected upon College property except as approved by College officials in connection with any authorized group. The distribution of leaflets to individuals is controlled by Board Policy 215.

d. Sound amplification, music, and other uses which might disturb or disrupt persons in adjacent buildings and classrooms is prohibited during normal business and class hours.

e. Commercial solicitation is prohibited.

f. All persons and groups using the designated areas are expected to conduct themselves in a respectful manner toward all students, College personnel, and College visitors. Users may not approach students and pressure or force them to take literature, or follow students to classes or elsewhere on campus.

g. All persons and groups using the designated areas must provide reasonable access to and from any building, including building doorways and other entrances and exits. Vehicular and pedestrian traffic should not be obstructed.

h. All persons and groups using College facilities are subject to federal and state laws and College Board Policies and rules applicable to such use.

i. Failure by a user to comply with the provisions of this procedure may result in denial or revocation of the ability to use the designated area.
# Employment Practices and Procedures

**SYNOPSIS:**

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<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Employment Policies; General</td>
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<td>8</td>
<td>Employment Agreements</td>
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<tr>
<td>9</td>
<td>Benefits</td>
</tr>
</tbody>
</table>

## Employment Policies; General:

a. **Qualifications:** To be eligible for employment by the College, a person must be qualified by an application of uniformly applied standards and must otherwise meet requirements of the position as prescribed by policy and the job description.

b. **Family Members:** In order to avoid nepotism, or the appearance thereof, a person may not be employed by the College if such employment would place a person under the direct or indirect supervision of a family member. For this policy, “family member” shall include grandparents, father, father-in-law, mother, mother-in-law, step parents, brother, brother-in-law, sister, sister-in-law, spouse, or child, as well as other relatives living in the person’s household. Exceptions to this policy may be made from time to time when other compelling circumstances warrant.

## Recruitment:

a. **Procedure:** Recruitment of personnel for the College shall be the responsibility of the President or designee. In the discharge of this responsibility, the President or designee shall make such use of other administrative and supervisory employees as may be practical and effective.

   Recruitment practices and procedures shall conform to the policies outlined in the current Affirmative Action Policy of the College.

b. **Staff Participation:** The staff is encouraged to participate with Deans/Supervisors and other administrative personnel of the College in the recruitment of staff. Staff recommendations may be solicited concerning the kinds of subject matter specialists needed to strengthen the various divisions and, when appropriate, divisional representation may be sought in the selection of candidates.

## Selection of Employees:

a. **Non-discrimination:** Selection shall be based upon the merits of the candidates and the necessary requirements of the position without regard to race, color, national origin, sex, disability, religion, creed, age, marital status, sexual orientation, gender identity, socioeconomic status, or military service.

b. **Criteria:** Selection shall be based on criteria specified in the job description.

## Employment Approval:

Prior to becoming effective, employment must be approved as indicated below:

a. Employment for regular appointments must be approved by the Board in a regular or special
**Employment Practices and Procedures**

<table>
<thead>
<tr>
<th><strong>DATE ADOPTED</strong></th>
<th><strong>NUMBER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>August 10, 1999</td>
<td>303</td>
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<tr>
<td>Revised November 15, 2005</td>
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<tr>
<td>Revised November 13, 2012</td>
<td></td>
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<tr>
<td>June 3, 2019</td>
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</table>

1. Meeting of the said Board before the employment contracts or agreements are considered valid.

2. Employment for temporary appointments may be approved by the President or designee.

3. Orientation: Each new employee shall attend such orientation meetings as may be presented by the College. The immediate supervisor of the employee shall provide orientation to the department to which the employee is assigned.

4. Personnel File: A personnel file shall be established for each regular employee of the College. Such a file may also be established for such temporary employees as deemed feasible. The file may include but is not limited to the following: (1) application for employment; (2) certification records (where applicable); (3) evaluations; (4) employment records; and (5) correspondence pertaining to employer/employee relations; (6) resume preferred.

Employees shall have access to their own personnel file. Procedures shall be adopted by the President or designee to ensure reasonable access while maintaining the security of the files.

Generally, the contents of an employee's personnel file will be destroyed five years after termination except for information relating to pending matters, i.e., continuing relationships because of early retirement (health insurance), or pending investigations or proceedings.

5. Physical Examination: A person seeking employment or presently employed by the College may be required to take a medical examination, drug test, or alcohol dependency evaluation at any time such examination appears necessary for the welfare of the College or community or as medical proof of the physical or mental ability to perform satisfactorily the assigned duties.

When and if an examination becomes a requirement as a condition of initial employment, the cost of meeting such requirement shall be paid by the applicant. Should an examination be required by the Board subsequent to employment, such examination cost shall be paid by the Board. The Board, however, shall retain the right to prescribe the type and extent of said examination and to specify the examining physician. Should the prescribed type and extent of said examination be performed by the employee's own physician, the Board will not be obligated to pay the cost.

6. Employment Relationships: An employment relationship will be determined upon appointment for employment. The document issued shall contain specific information pertaining to employment as indicated below.

a. Regular faculty and regular, certificated support staff administrative personnel shall be issued a contract in writing which shall state the number of contract days, the annual compensation to be paid, and any other matters as may be mutually agreed upon.

b. Adjunct instructors and regular non-certificated support staff personnel shall be issued a written letter which shall indicate the employment length, the compensation to be paid, and any other matters as may be mutually agreed upon.

7. Benefits: Benefits for employees shall be as enumerated in the personnel handbook or master agreement, whichever applies to each respective category of employee.
## Tuition Reimbursement

<table>
<thead>
<tr>
<th>EMPLOYEES</th>
<th>Tuition Reimbursement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETF 305</td>
<td></td>
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</table>

### SYNOPSIS:

1. **Regular Employees**: Regular full-time Employees of the College shall be reimbursed 100 percent of tuition for Iowa Central credit classes upon successful completion of each session. Employee must receive a grade of C or better, which shall be indicated in a signed statement from the Registrar to the Business Office.

2. **Spouse or Dependent**: A spouse or dependent child(ren) (birth or legally adopted only) of regular full-time employees of the College shall be reimbursed 100 percent of tuition for Iowa Central credit classes upon successful completion of each session. The spouse/child must receive a grade of C or better, which shall be indicated in a signed statement from the Registrar to the Business Office.

3. **Additional Guidelines**:
   
a. The maximum hours of reimbursable credit shall be 15 18 per semester.

b. Any scholarship or grant (Federal, State, or local) received by the employee/spouse/dependent child will first be applied toward tuition for purpose of determining the tuition reimbursement. The calculation is based on actual cash paid by the employee/spouse/dependent child for tuition.

c. An employee/spouse/dependent child cannot take the place of another student if the class is full.

d. The full-time Iowa Central employee must be employed for the entire session for which the reimbursement is being claimed.

e. The request for tuition reimbursement must be submitted within 90 days of completion of each session.

---

1Regular full-time employees are those who qualify for the full group insurance program.

2Tuition only -- this does not include fees, books, or residence halls.
SYNOPSIS:

1 Purpose

The College recognizes that a wide range of problems, not directly associated with one’s job, can and does affect an employee’s job performance. The range of problems includes, but is not limited to, physical, mental, emotional, or chemical dependency illnesses, legal or financial problems, alcohol or drug abuse, and marital problems. Neither the College nor its employees claims to be expert in the treatment of problems. The College, through its employees, will attempt to serve as an identifier of problems and link between the troubled employee and the appropriate source of help.

As a referral source, the College will attempt to encourage employees who appear to fall within one or more of the problem areas to participate in the Employee Assistance Program. The College is not responsible for any damages whatsoever to any employee or third party for its role as referral source in this employee assistance program.

- To define the College’s commitment and obligation to assist employees who are in need of help.
- To provide a service that has a single goal of retaining the employee as an efficient and effective contributor of the College.
- To inform employees burdened with personal problems, which in the opinion of the College contribute to or result in unsatisfactory job performance that professional assistance will be made available. Help in resolving problems will be conducted in a confidential manner.

2 Procedure and Conditions: Identification of employees in need of assistance will be attempted by:

a. Self-referral: Employees with problems which they feel may affect their work performance are encouraged to seek counseling and information on a confidential basis by contacting their supervisor or the College nurse mental health counselor.

b. Supervisor referral: Supervisors will be encouraged to recommend and suggest that employees pursue counseling for excessive absenteeism, inappropriate behavior, or unsatisfactory job performance.

c. Other concerned persons are encouraged to provide information on the perceived problem to the employees’ supervisor or College nurse mental health counselor.

Once the identification of a possible problem has been made, the employee would receive a referral to go for a professional evaluation.

The College nurse mental health counselor will work with the employee and the appropriate professional source of help to monitor the employee’s progress in the program.

The employee’s participation in the program will be at the employee’s expense. A portion or all of the program expense may be covered under an insurance plan with the College. Questions concerning possible coverage through the College should be addressed to the Personnel Office.
<table>
<thead>
<tr>
<th>CHAPTER: Educational Programs</th>
<th>DATE ADOPTED</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUCATIONAL PROGRAMS</td>
<td>July 11, 2006</td>
<td>501</td>
</tr>
<tr>
<td></td>
<td>Revised: April 11, 2017</td>
<td></td>
</tr>
</tbody>
</table>

**SYNOPSIS:**

| 1 | General Policy | It shall be the policy of the College to offer the broadest array of programs and services consistent with:  
   a. needs, wishes, and circumstances of the people of the region;  
   b. optimal use of available resources;  
   c. Section 260.C, Code of Iowa (See also Number 102) |
<table>
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<tr>
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<tbody>
<tr>
<td>2</td>
<td>Degrees Authorized</td>
<td>The College shall award the Associate in Arts, Associate in Science, Associate in Applied Science, Associate in Professional Studies, Associate of Applied Arts, and Associate in General Studies degrees. Requirements for each degree shall be approved by the Board and shall be listed in the catalog. It is intended that associate degrees shall apply only to curricula having a minimum length of four semesters or sixty (60) semester hours of credit.</td>
</tr>
<tr>
<td>3</td>
<td>Diplomas Authorized</td>
<td>The College shall award a diploma for the successful completion of a curriculum of less than two years’ duration. Requirements for the diploma shall be approved by the Board and shall be listed in the College catalog.</td>
</tr>
</tbody>
</table>
| 4 | Certificates Authorized | a. Certificates of Completion: The Certificates of Completion shall be authorized for award in a manner to be determined by the President. It is intended that Certificates of Completion be awarded for the completion of curriculums or programs, although exceptions may be allowed.  
   b. Continuing Education Unit Certificate: The Continuing Education Unit (CEU) Certificate shall be authorized for award for participation in an organized education experience under responsible capable direction and qualified instruction in which one CEU is defined as ten (10) contact hours of such participation.  
   c. Other Certificates Awarded: Other certificates, such as Certificates of Appreciation, may be awarded based on criteria approved by the President. |
<p>| 5 | Commencement Ceremonies | A commencement ceremony shall be held at least once each year in order to formally recognize candidates for degrees and diplomas. Recognition ceremonies are also authorized for those awarded the certificates. |</p>
<table>
<thead>
<tr>
<th>CHAPTER: Educational Programming Practices</th>
<th>DATE ADOPTED</th>
<th>NUMBER</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>August 10, 1999</td>
<td>502</td>
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<td>Revised November 15, 2005</td>
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<td></td>
<td>June 3, 2019</td>
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</table>

**SYNOPSIS:**

1. **College Catalog:** The President or designee shall publish an official College catalog prior to the year(s) for which it is applicable. The catalog shall include, but shall not be limited to, degree and diploma requirements, course names and descriptions, and pertinent student information.

   Changes which are necessary during the life of a catalog prior to a new one shall be published and distributed in such a manner as to attain a wide distribution of the changes.

   The President or designee shall adopt procedures to ensure proper staff participation in developing and reviewing catalog content.

   Copies of the catalog shall be available from the office of the Registrar and online.

2. **College Calendar:** The Vice President of Instruction shall oversee the preparation of a College calendar which shall be submitted to the Board for approval.

   Copies of the College calendar shall be available from the office of the Board Secretary.

3. **College Day:** The school day and school week shall be established to accommodate the programs offered by the College. Hours of operation shall be determined by the President or designee. Special permission may be granted for activities conducted outside the normal hours of operation.

4. **Program Evaluation:** The President or designee shall develop and maintain a program evaluation activity with periodic reports made to the Board.

   Copies of current evaluation procedures are available from the office of the Vice President of Instruction.

5. **Articulation with Secondary Schools:** A program of articulation with secondary schools shall be continuous and shall place emphasis on facilitating the matriculation of high school graduates.

6. **Articulation with Postsecondary Institutions:** A continuous communication process between the College and senior colleges and universities to which Iowa Central Community College students frequently transfer shall exist. Emphasis shall be placed on facilitating the transfer process.

7. **Credit by Examination:** The issuance of credit by means of examination shall be authorized. The examination may be a section of the College Level Examination Program or other staff-approved test. A maximum of thirty (30) credit hours achieved by examination may be counted toward an associate degree. The President or designee shall adopt necessary procedures and fees for the administration of the program.

8. **Armed Forces Credit:** Credit may be granted for valid educational experience received in the Armed Forces. Credit will be considered on the same basis as that followed in accepting transfer credit. A Guide to the Evaluation of Educational Experiences in the Armed Forces will be used to aid in evaluation. The President or designee shall adopt necessary procedures and fees for the administration of the program.
<table>
<thead>
<tr>
<th>Experiential Credit:</th>
<th>Credit for Prior Learning: Credit may be granted (30 semester hours maximum) for experiential learning. Experiences in the Industrial Trades and Supervision Management Program.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit from Other Institutions: All credits which have been earned at a college accredited by a recognized regional accreditation agency shall be eligible for application toward an authorized associate degree, diploma, or certificate, except that all requirements of the award must be met. Credits from colleges not accredited by a postsecondary regional accreditation agency may be accepted if judged to be of suitable quality.</td>
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</tbody>
</table>
SYNOPSIS:

1. Open Discussion in the Classroom: The Board believes that, in a world of rapid change, college best serves its community, not as a stronghold of rigid tradition, but as an open, intellectual forum where varying shades of opinion may be freely expressed and fairly debated.

   The Board believes that a free society functions efficiently only if its citizens have the right to discuss, debate, and agree or disagree constructively.

   The Board believes that an educated citizenry, fully aware of all the evidence, is best able to preserve the valuable heritage of American democratic institutions.

   The Board believes that the community college has an obligation to its community to promote healthy discussion as an educative force.

   The Board seeks to enlist a faculty whose members subscribe to high standards of professional conduct, who are specialists in the various subject matter areas, and who are fair and constructive in presenting ideas and issues to the students.

   The Board desires to foster in students a respect for differing points of view, the ability to discriminate between fact and fiction, and the capacity to think critically.

   The Board supports the invitation of outside speakers representing diverse points of view. In return, it reserves the right to impose specific conditions insuring that opportunity be provided for students to hear opposing sides of a question.

2. Teaching Controversial Issues:

   a. The teaching of controversial issues is appropriate as long as the following conditions are met:

      (1) The teaching of religious or sectarian beliefs should be included in class discussion only to the extent that they are consistent with the curriculum and are presented in an objective manner. Determination as to what constitutes "appropriate religious or sectarian instruction" shall rest with the President or designee with the advice of the faculty.

      (2) The discussion of controversial issues comes within the range of the knowledge, maturity, and competence of students.

      (3) Problems and issues selected for discussion and study shall be current, significant, and/or of interest to students.
(4) Attention given to controversial issues shall be only that required to meet the objectives of the curriculum.

b. Whenever a controversial issue is to be included in the curriculum, the instructor shall have the following rights and responsibilities:

(1) The instructor shall determine whether the issue raised is to be considered at the moment; whether there will be time to explore the issue sufficiently; what the relation of the problem to be considered is to the course or the curriculum; whether the students are prepared or ready to study the issue; and whether the instructor is prepared to handle it effectively.

(2) The students should be informed of the importance of and the reason for considering controversial issues. If an issue is not to be studied, the students have a right to know the reason why, and the instructor has an obligation to explain.

(3) The instructor, as a moderator and a participant, shall point out the possibility of errors in statements of students and writers and the possibility of alternative points of view. All facts, evidence, and aspects of an issue should be honestly presented so that students are helped to evaluate their sources of data as well as their own procedures and conclusions.

(4) The instructor has a right to express an opinion, providing the students understand that it is not an authoritative answer. The judgment of students should not be limited or controlled directly or indirectly. Indoctrination must be avoided.

(5) The instructor shall resist pressures which demand withholding of important facts.

(6) The instructor shall uphold, protect, and defend the American democratic way of life.

c. Responsibilities of Administration:

(1) If an instructor is in doubt regarding the appropriateness of discussing certain controversial issues in the classroom, he/she should discuss the matter with the proper Dean. If the Dean and instructor are unable to agree, the matter should be referred to the Vice President of Instruction and then to the President.

(2) No group or individual has the right to present arguments for or against any issue under study directly to students or to the class without authorization.
<table>
<thead>
<tr>
<th>CHAPTER: Instruction</th>
<th>DATE ADOPTED</th>
<th>NUMBER</th>
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<tbody>
<tr>
<td></td>
<td>August 10, 1999</td>
<td>503</td>
</tr>
<tr>
<td></td>
<td>Revised January 14, 2003</td>
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</tr>
</tbody>
</table>

a. Students shall be notified of their progress on a regular basis and shall receive notification of their grade-to-date at mid-term.

b. Within one year of the submission of an “I” grade, it will be changed either to the second grade entered or to an “F”, at the expiration of the date set in the agreement (no longer than 1 year from the start date of the course).

c. The Director of Student Records office and the Coordinator of Student Records will be the only persons able to process grade changes (password protected).

d. Grades will be entered only by the instructor assigned to the course or his/her respective Dean office.

e. A course cannot be flagged as graded until all students have received a grade for the course.

7 Class Records: Class records including grades and attendance shall be submitted at the end of each semester or other term to the Director of Student Records.

8 Textbook and Material Selection: The President or designee shall adopt procedures for the selection of textbooks and resource materials.

9 Curriculum and Revision: The President or designee shall develop standards for curriculum development and revisions.

10 Course Schedule: Deans and the Vice President of Instruction are responsible for the development of course schedules. Only Deans and the Vice President of Instruction can authorize the class schedule.

11 Employee Responsibility: Any employee that does not comply with the course grading system and transcript process shall be subject to disciplinary action which may include dismissal.
<table>
<thead>
<tr>
<th>SYNOPSIS:</th>
<th>1</th>
<th>General Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Policy: All department/program activities, sanctioned club/organization activities and athletic activities shall be approved by the appropriate College officials. The sponsoring staff member shall be responsible for all arrangements such as safety, time schedule, accommodations, itinerary, etc. The sponsoring staff member shall also have the responsibility of notifying appropriate faculty in advance of the activity that students will be missing their classes. Students will not lose credit for classes missed provided they satisfactorily complete make-up work assignments within a reasonable time. It is the student's responsibility to make arrangements for missed work prior to the excused absence school sponsored absence.</td>
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</tbody>
</table>
General Policy: If any materials and/or supplies are to be sold by an instructor to students in a class, prior approval must be obtained from the appropriate Dean supervising the class.

Materials and/or supplies are to be sold to students only if the items are essential for the class and not readily available from the College Bookstore or local commercial establishments.

Students must be free to purchase materials and/or supplies from any source for a class.

If materials and/or supplies are sold by the instructor in a class, the items must be sold to the students at cost.

The College is not liable for the loss of any of these materials and/or supplies.
SYNOPSIS:

1. General Policy
   It shall be the policy of Iowa Central Community College that all forms of Distance Learning courses be of the same rigor and outcomes compared to traditional course delivery.

2. Guided Self-Study and Internet Courses:
   Guided Self-Study and Internet courses are an alternative instructional delivery system. All course work is completed by the student. The faculty member serves as an instructor and mentor in the process. All Guided Self-Study and Internet courses must be approved by the Department Review Team, the Department chairs, Dean of Distance Learning, the Director of Distance Learning, and the Vice President of Instruction.

   a. All Internet course welcome information will be sent to each student via the Iowa Central e-mail account. Guided Self-Study and Internet instructional materials will be sent certified mail with return receipt required.

   b. Only the Student Records office, Fort Dodge Center, may enroll students in Guided Self-Study and Internet courses. Any advisor may enroll a student into an Internet course prior to the start of a semester. Once the semester has begun, the advisor must contact the Student Records Office in order to enroll a student.

   c. Guided Self-Study and Internet students who have not paid in full for their course after one week four days into a semester will be automatically dropped from the course(s).

   d. The Student Records Office is responsible for moving grades to the student’s transcript for FLEX Lab, Guided Self-Study, and Internet courses according to the following guidelines:

      (1) The instructor responsible for the course enters grade into the computer.

      (2) Student Records staff is notified that the course needs to be moved to the transcript verifies grades to be moved to the transcript daily.

      (3) Grade is moved to the transcript by the Director of Student Records or Coordinator of Student Records.
Mentzer, Stacy

From: Russell, Chris <chris.russell@iowa.gov>
Sent: Friday, May 24, 2019 12:55 PM
To: Kinney, Dan
Cc: Jeremy Varner; Barbara Burrows; Eric St Clair [IDOE]; Condon, Jennifer; Mentzer, Stacy; Adams, Neale; Walter, Allyson; Russell, Chris [IDOE]
Subject: Biology Transfer Major (AA) under CIP#, 26.01010200 and ITSO 03 08 11 03 and Biology Transfer Major (AS) under CIP#, 26.01010200 and ITSO 03 09 11 03

This e-mail is being transmitted on behalf of Barbara Burrows, Ph.D., Chief, Bureau of Community Colleges.

Dear President Kinney,

The following program submitted by Iowa Central Community College meets the compliance criteria of its aligned state-approved discipline framework, as well as the Associate of Arts and Associate of Science degree requirements established in the statewide transfer agreements.

Biology Transfer Major (AA) under CIP#, 26.01010200 and ITSO 03 08 11 03
Biology Transfer Major (AS) under CIP#, 26.01010200 and ITSO 03 09 11 03

The authorized course listing forms for this transfer major have been placed under your college folder on the Transfer Major Google Site where steering committee members and CAO's have access at: https://sites.google.com/a/iowa.gov/transfer-majors/

Should you or your staff have any questions or concerns regarding this program or process, please contact Barbara Burrows or Chris Russell at the Iowa Department of Education:
barbara.burrows@iowa.gov
chris.russell@iowa.gov

We wish you and your faculty, staff, and students much success with this program.

--

Chris Russell, Ph.D.
Education Program Consultant, Program Quality
Iowa Department of Education
Division of Community Colleges & Workforce Preparation
Grimes State Office Building
(515) 725-2247 Work
(515) 242-5988 Fax
chris.russell@iowa.gov

"NOTICE TO RECIPIENT: THIS MESSAGE AND ANY RESPONSE TO IT MAY CONSTITUTE A PUBLIC RECORD, AND THEREFORE, MAY BE AVAILABLE UPON REQUEST IN ACCORDANCE WITH IOWA PUBLIC RECORDS LAW, IOWA CODE CHAPTER 22."
**CAUTION**: This message originated from outside of Iowa Central.

This e-mail is being transmitted on behalf of Barbara Burrows, Ph.D., Chief, Bureau of Community Colleges.

Dear President Kinney:

The following program submitted by Iowa Central Community College meets the compliance criteria of its aligned state-approved discipline framework, as well the Associate of Arts or Associate of Science degree requirements established in the statewide transfer agreements.

**Criminal Justice Transfer Major (AA) under CIP#, 43.01070200 and ITSO 03 08 11 03**

The authorized course listing forms for this transfer major have been placed under your college folder on the Transfer Major Google Site at:
https://sites.google.com/a/iowa.gov/transfer-majors/

Should you or your staff have any questions or concerns regarding this program or process, please contact Barbara Burrows or Chris Russell at the Iowa Department of Education:
barbara.burrows@iowa.gov
chris.russell@iowa.gov

We wish you and your faculty, staff, and students much success with this program.

--

Chris Russell, Ph.D.
Education Program Consultant, Program Quality
Iowa Department of Education
Division of Community Colleges & Workforce Preparation
Grimes State Office Building
(515) 725-2247 Work
(515) 242-5988 Fax
Chris.Russell@iowa.gov

"NOTICE TO RECIPIENT: THIS MESSAGE AND ANY RESPONSE TO IT MAY CONSTITUTE A PUBLIC RECORD, AND THEREFORE, MAY BE AVAILABLE UPON REQUEST IN ACCORDANCE WITH IOWA PUBLIC RECORDS LAW, IOWA CODE CHAPTER 22."
<table>
<thead>
<tr>
<th>Core Elements</th>
<th>Cr Hrs</th>
<th>CC Course Number</th>
<th>Community College Course Name</th>
<th>4-Year Public</th>
<th>Cr Hrs</th>
<th>4-Year Course #</th>
<th>4-Year Course Name</th>
<th>Discipline Framework Subcommittee Comments / Proposed Action(s)</th>
<th>4-Year Institution’s Responses to Proposals/Requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to Criminal Justice</td>
<td>3</td>
<td>CRJ100</td>
<td>Introduction to Criminal Justice</td>
<td>ISU 3</td>
<td>CJ ST 240</td>
<td>Intro to US Criminal Justice System</td>
<td></td>
<td>NOTE: Reviewing to see if it could sub for CJ ST 342. If so, students still need to take 12 credits of 300-level CJ coursework.</td>
<td></td>
</tr>
<tr>
<td>Intro to Sociology</td>
<td>3</td>
<td>SOC130</td>
<td>Introduction to Sociology</td>
<td>ISU 3</td>
<td>SOC 134</td>
<td>Introduction to Sociology</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Criminology</td>
<td>3</td>
<td>CRJ100</td>
<td>Criminology</td>
<td>ISU 3</td>
<td>CJ ST 21**</td>
<td>Criminology</td>
<td></td>
<td>NOTE: Reviewing to see if it could sub for CJ ST 341. If so, students still need to take 12 credits of 300-level CJ coursework.</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td>SOC240</td>
<td>Criminology</td>
<td>ISU 3</td>
<td>SOC 240</td>
<td>Criminology</td>
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<td></td>
</tr>
<tr>
<td>Statistics</td>
<td>3</td>
<td>MAT156</td>
<td>Statistics</td>
<td>ISU 3</td>
<td>STAT 301</td>
<td>Introduction to Statistics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>OR</td>
<td></td>
<td>MAT157 (4 cr)</td>
<td>Statistics</td>
<td>ISU 3</td>
<td>STAT 301</td>
<td>Elementary Statistics and Inference</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>3</td>
<td>POL111</td>
<td>Introduction to American Government</td>
<td>ISU 3</td>
<td>POL 310</td>
<td>Introduction to American Government</td>
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<td>Juvenile Delinquency</td>
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<td>OR201</td>
<td>Juvenile Delinquency</td>
<td>ISU 3</td>
<td>CJ ST 241</td>
<td>Youth and Crime</td>
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</tr>
</tbody>
</table>
Mentzer, Stacy

From: Russell, Chris <chris.russell@iowa.gov>
Sent: Tuesday, April 23, 2019 2:19 PM
To: Kinney, Dan
Cc: Jeremy Varner; Barbara Burrows; Bassis, Vladimir [IDOE]; Russell, Chris [IDOE]; Mentzer, Stacy; Condon, Jennifer; Walter, Allyson
Subject: Transfer Major Program Approval: Psychology CIP# 42.01010200 03.08.11.03

**CAUTION** This message originated from outside of Iowa Central.

This e-mail is being transmitted on behalf of Barbara Burrows, Ph.D., Chief, Bureau of Community Colleges.

Dear President Kinney:

The following program submitted by Iowa Central Community College meets the compliance criteria of its aligned state-approved discipline framework, as well the Associate of Arts or Associate of Science degree requirements established in the statewide transfer agreements.

Psychology Transfer Major (AA) under CIP#, 42.01010200 and ITSO 03 08 11 03

The authorized course listing forms for this transfer major have been placed under your college folder on the Transfer Major Google Site at:
https://sites.google.com/a/iowa.gov/transfer-majors/

Should you or your staff have any questions or concerns regarding this program or process, please contact Barbara Burrows or Chris Russell at the Iowa Department of Education:
barbara.burrows@iowa.gov
chris.russell@iowa.gov

We wish you and your faculty, staff, and students much success with this program.

--

Chris Russell, Ph.D.
Education Program Consultant, Program Quality
Iowa Department of Education
Division of Community Colleges & Workforce Preparation
Grimes State Office Building
(515) 725-2247 Work
(515) 242-5988 Fax
Chris.Russell@iowa.gov

"NOTICE TO RECIPIENT: THIS MESSAGE AND ANY RESPONSE TO IT MAY CONSTITUTE A PUBLIC RECORD, AND THEREFORE, MAY BE AVAILABLE UPON REQUEST IN ACCORDANCE WITH IOWA PUBLIC RECORDS LAW, IOWA CODE CHAPTER 22."
<table>
<thead>
<tr>
<th>Core Elements</th>
<th>Cr Hrs</th>
<th>CC Course Number</th>
<th>Community College Course Name</th>
<th>4-Year Public</th>
<th>Cr Hrs</th>
<th>4-Year Course #</th>
<th>4-Year Course Name</th>
<th>Discipline Framework Subcommittee Comments / Proposed Action(s)</th>
<th>4-Year Institution's Responses to Proposals/Requests</th>
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<td>Introduction to Psychology</td>
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<td>PSY 210</td>
<td>Elementary Psychology</td>
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<td>Biological Science (Biology with Lab)</td>
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<td>Introduction to Biology with Lab</td>
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<td>BIO 101</td>
<td>Introductory Biology</td>
<td>ISU: 3 BIO 101: Introduction to Biology</td>
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<td>OR</td>
<td>BIO112 or BIO113 or BIO114 or BIO115 or BIO116 or BIO117 or BIO120 or BIO202 or BIO203</td>
<td>General Biology with Lab</td>
<td>ISU 4</td>
<td>BIO 211+</td>
<td>Principles of Biology I</td>
<td>ISU: 4 BIO 211+: Principles of Biology I</td>
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<td>OR</td>
<td>BIO154 + 155 or BIO157</td>
<td>Human Biology with Lab</td>
<td>UNI 4</td>
<td>BIO 141</td>
<td>Foundations of Biology</td>
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<td>OR</td>
<td>BIO101 or BIO164 or BIO265 + 167 or BIO388 or BIO169 or BIO375 + 176 or BIO237</td>
<td>Anatomy &amp; Physiology with Lab</td>
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<td>BIO 155</td>
<td>Human Biology</td>
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<td>Introduction to Philosophy</td>
<td>UNI 3</td>
<td>PHI 1020</td>
<td>Philosophy: The Art of Thinking</td>
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<td><strong>UNI</strong> 3 PHI 1020: Philosophy: The Art of Thinking</td>
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</table>

**Notes:**
- **ISU** refers to Iowa State University.
- **UNI** refers to University of Northern Iowa.
- **SUI** refers to Sioux Falls University.
- **Cr Hrs** refers to course hours.
- **4-Year Public** refers to the 4-year course number at the community college.
- **4-Year Course #** refers to the 4-year course number at the university.
- **Course Name** refers to the course name at the university.
- **Discipline Framework Subcommittee Comments / Proposed Action(s)** refers to comments and proposed actions from the discipline framework subcommittee.
- **4-Year Institution's Responses to Proposals/Requests** refers to responses from the institution regarding proposals or requests.
<table>
<thead>
<tr>
<th>OP</th>
<th>PHI 105</th>
<th>Introduction to Ethics</th>
<th>UNI</th>
<th>3</th>
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<th>Reasoning about Moral Problems</th>
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<td>Cr Hrs</td>
<td>CC Course Number</td>
<td>Community College Course Name</td>
<td>4-Year Public</td>
<td>Cr Hrs</td>
<td>4-Year Course #</td>
<td>4-Year Course Name</td>
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<td>OR</td>
<td></td>
<td>CHM 163 + CHM164</td>
<td>General Chemistry I &amp; Lab &amp; General</td>
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</table>

These 6 combinations of community college courses meet both courses of the following Regent requirements:

- ISU 4 BIO211/211L Principles of Biology I & Lab Grade C- or higher required.
- UNI 4 BIOL 2051 Organismal Diversity
- SUI 4 BIOL 1411 Foundations of Biology
- ISU 4 BIO211/211L Principles of Biology I & Lab
- UNI 4 BIOL 2052 Cell Structure and Function
- SUI 4 BIOL 1412 Diversity of Form and Function

These 5 combinations of community college courses meet both courses of the following Regent requirements:

- ISU 4 MATH 165 Calculus I
- UNI 4 MATH 1420 Calculus I
- SUI 4 MATH 1850 Calculus I
- ISU 4 MATH 165 Calculus II
- UNI 4 MATH 1420 Calculus II
- SUI 4 MATH 1850 Calculus II

- ISU 4 CHEM 277/277L General Chemistry I & Lab
- UNI 4 CHEM 1110 General Chemistry I
- SUI 4 CHEM 1110 Principles of Chemistry I
- ISU 4 CHEM 278/278L General Chemistry II & Lab
- UNI 4 CHEM 1120 General Chemistry II
- SUI 4 CHEM 1120 Principles of Chemistry II
| OR | CHM150 + CHM161 + CHM176 + CHM177 1 (S) | Chemistry I + Lab & Chemistry II + Lab |

Note: 1 year of a algebra or calculus-based Physics sequence and an Organic Chemistry course is also helpful within the first 2 years to stay on track within some Regent Biology programs. Other Regent majors besides BA/BS in Biology where this framework is a foundation include Neuroscience, Biomedical Science and Health & Human Physiology at the University of Iowa and Biophysics, Genetics, Biochemistry, and Bioinformatics and Computational Biology at Iowa State University.
The Engineering & Design Tech Program requests to submit the following changes for a divisional vote:

1. Addition of four new courses: Intro to 3d Modeling, Modeling & Simulation 1, Modeling & Simulation 2, and Intro to Systems.
2. Removing Welding & Fabrication courses from the program of study.
4. Renaming Mechanics 1 to Statics & Strength of Materials to match UNI naming.
5. Renaming Mechanics 2 to Kinematic Analysis to match UNI naming.
6. Reordering of courses to better distribute credit load.

The changes have been reviewed and approved by the advisory committee.

Advisory Committee:

Voted to approve the changes to the Engineering Design Technology Program.

STEMM Division:

Voted to approve the changes to the Engineering Design Technology Program.
Liberal Arts Division

Curriculum Changes

April 2019

1. Communications Department
   a. No changes

2. Social Sciences Department (Education and Psychology)
   a. Drop SDV-035 Classroom Assistance from course catalog
      i. Rationale: This class as numbered under 100 does not qualify per Iowa Department of Education as a developmental education course. Dr. Mentzer was advised to remove the class from our reporting, so that means dropping the class from our offerings. If the class serves another purpose in the future like supplemental instruction or other strategy, the course will need a new number, name, and syllabus anyway.
   b. Add EDU 245
      i. Rationale: Jeff Halter worked with a statewide discipline framework committee to define 18 credits needed for both an education transfer major and an elementary education transfer major. It is possible that an early childhood transfer major will require this class as part of the 18 credits needed for the discipline framework (meeting April 25). This course should be a direct transfer to the Iowa Regents and some private universities as it is a direct transfer for most community colleges who already offer the course. Syllabus attached.

3. Humanities Department
   a. No changes
Fire Science

ADD:
- FIR XXX Fundamentals of Firefighting II (new course) 4.5 credits
- FIR XXX Fundamentals of Firefighting III (new course) 3 credits
- FIR XXX Fundamentals of Firefighting IV (new course) 3 credits
- SDV 108 The College Experience 1 credit
- BUS 114 Workplace Communications 3 credits
- EMS 200 Emergency Medical Technician (EMT) 8 credits
- Science General Education Elective 3 credits

TOTAL: 25.5 credits added

DROP:
- ENG 105 Composition I 3 credits
- SPC 112 Public Speaking 3 credits
- FIR 200 Occupational Safety/Health in the Emergency Services 3 credits
- FIR 235 Fire Investigation I 3 credits
- FIR 236 Fire Investigation II 3 credits
- FIR 226 Fire Administration I 3 credits
- FIR 149 Fire Protection & Water 3 credits
- CRJ XXX Criminal Justice Elective (x2) 6 credits

TOTAL: 27 credits dropped

Original Program Credit Hours: 64.5
Proposed Program Credit Hours: 63

NEW COURSE:
- FIR XXX Mathematics and Problem Solving for Firefighters 3 credits
- FIR XXX Hazardous Materials Chemistry 3 credits

Note: FIRXXX Mathematics and Problem Solving for Firefighters will need to approved by Curriculum committee as General Education Math course before it will be officially offered as the Math Elective course for program

Note: FIRXXX Hazardous Materials Chemistry—will also be taken to Curriculum and Instruction to be proposed as a Science General Education course

New program outline attached below
Recreational Facilities Management

ADD: REC XXX  Field Experience in Sports Management (new course)  3 credits

Criminal Justice

Course Name Change
DROP:
CRJ 133 Constitutional Criminal Procedures
ADD:
CRJ-130 Criminal Law

This change is due to common course numbering - State-wide Criminal Justice Articulation Committee

Health and Beauty Management

DROP:
BUS 130 Intro to Entrepreneurship
ADD:
BUS-102 Intro to Business

Will meet the 15 General Education Credit rule

Culinary Arts
Culinary Arts AAS - Addition of new AAS Program – attached below

NEW COURSE:
HCM XXX International Cuisine II 4 credits

Business
CSC 116 Business Computing (new course) 3 credits

Will be taken to Curriculum and Instruction for General Education Computer Literacy consideration
## Industrial Technology Department

### Curriculum Changes

April, 2019

### Welding Technology DIPL

**ADD:**
- WEL XXX  Welding Technology Fundamentals  2 credits
- WEL XXX  Pipe Welding II  2 credits
- WEL XXX  Thermal Cutting and Welding  1 credit

**TOTAL:** 5 credits added

**DROP:**
- WEL 122  Beginning Welding  2 credits
- WEL 340  Maintenance Welding  2 credits
- IND 127  Shop Operations  1 credit
- IND 126  Precision Measurements  1 credit

**TOTAL:** 6 credits dropped

Original Program Credit Hours: 35 credits
Proposed Program Credit Hours: 34 credits

**Either/Or Options (Correctional Facilities)**
- MFG 256 Intro to Lathe and MFG 266 Intro to Mill (4 total credits)
- OR
- IND 110 CPR First Aid and Safety and BUS 114 Workplace Communications (4 total credits)

### Welding Certificate

**ADD:**
- WEL XXX  Welding Technology Fundamentals  2 credits
- WEL XXX  Thermal Cutting and Welding  1 credit

**DROP:**
- WEL 122  Beginning Welding  2 credits
- IND 127  Shop Operations  1 credit

Original Program Credit Hours: 9 credits
Proposed Program Credit Hours: 9 credits

### Production Welding Certificate

**ADD:**
- WEL XXX  Thermal Cutting and Welding  1 credit
DROP:
WEL 122 Beginning Welding 2 credits

Original Program Credit Hours: 6 credits
Proposed Program Credit Hours: 5 credits

New program offerings are attached below

**Diesel Technology**
DROP:
DSL 932 Diesel Technology Internship 3 credits

**Industrial Mechanics**

ADD:
IND –XXX Industrial Maintenance Solutions 2 credits
CAD 101 Intro to CAD 3 credits

TOTAL: 5 credits added

DROP:
WEL 340 Maintenance Welding 2 credits
WEL 213 Fabrication, Layout, Estimating and Repair OR
WEL 214 Advanced Fabrication 2 credits

TOTAL: 4 credits added

Original Program Credit Hours: 34 credits
Proposed Program Credit Hours: 35 credits
# Iowa Central Community College Welding Technology Program

<table>
<thead>
<tr>
<th>Class</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
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<tbody>
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<td>WEL-122 Beginning Welding</td>
<td>45</td>
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<tr>
<td>MAT-763 Technical Math</td>
<td>45</td>
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<tr>
<td>IND-126 Precision Measurements Lab</td>
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<tr>
<td>WEL-110 Welders Blueprint Reading</td>
<td>30</td>
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<tr>
<td>WEL-213 Fabrication, Layout, Estimating &amp; Repair</td>
<td>45</td>
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</tr>
<tr>
<td>WEL-170 Shielded Metal Arc Welding</td>
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<tr>
<td>WEL-181 Gas Metal Arc Welding</td>
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<td>2</td>
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<tr>
<td>MFG-260 Intro to Mill Operations</td>
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<td><strong>Total</strong></td>
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<tr>
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<tbody>
<tr>
<td>WEL-171 Advanced SMAW</td>
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<tr>
<td>WEL-214 Advanced Fabrication</td>
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<tr>
<td>WEL-190 Gas Tungsten Arc Welding</td>
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<tr>
<td>WEL-301 Pipe Welding</td>
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<td>2</td>
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<tr>
<td>WEL-340 Maintenance Welding</td>
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<tr>
<td>WEL-178 Advanced GMAW</td>
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<td>WEL-196 Advanced GTAW</td>
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<tr>
<td>IND-184 Mechanical Processes</td>
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<td>MFG-256 Intro to Lathe Operations</td>
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<tr>
<td>WEL-181 Gas Metal Arc Welding</td>
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<tr>
<td>WEL-213 Fabrication, Layout, Estimating &amp; Repair</td>
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<td>WEL-178 Advanced GMAW</td>
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<td>WEL-196 Advanced GTAW</td>
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<td>IND-127 Shop Operations</td>
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<th>Production Welding Certificate</th>
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<tbody>
<tr>
<td>WEL-122 Beginning Welding</td>
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<tr>
<td>WEL-213 Fabrication, Layout, Estimating &amp; Repair</td>
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<td>2</td>
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<td>WEL-181 Gas Metal Arc Welding</td>
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<td>MFG-257 Advanced Lathe</td>
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**Total Credit Hours:** **352.5**
The items in red are examples.

Course Name: Introduction to Organic and Biochemistry
Course Number: CHM-132
Course Department: Science
Course Term:
Last Revised by Department: September 2018
Total Semester Hour(s) Credit: 4

Total Contact Hours per Semester:

  Lecture: 45  Lab: 30  Clinical: 0  Internship/Practicum:

Catalog Description: This course is a study of organic chemistry and biochemistry. Topics in the course include structure, nomenclature, nature and reactions of the functional groups, stereochemistry, carbohydrates, proteins, lipids, nucleic acids, and metabolism. Three hours lecture. Two hours lab.

Pre-requisites and/or Co-requisites: CHM-110 Introduction to Chemistry or equivalent


Access Code: (If the course requires an access code, please state that here. Please list the ISBN number)

Materials Required: (All additional course material, i.e. a folder, calculator, etc. If you are requiring "clickers," include that statement here)

Suggested Materials: (include anything that might help your students, i.e. a suggested reading list)

Institutional Outcomes:

  Critical Thinking: The ability to dissect a multitude of incoming information, sorting the pertinent from the irrelevant, in order to analyze, evaluate, synthesize, or apply the information to a defendable conclusion.

  Effective Communication: Information, thoughts, feelings, attitudes, or beliefs transferred either verbally or nonverbally through a medium in which the intended
meaning is clearly and correctly understood by the recipient with the expectation of feedback.

Personal Responsibility: Initiative to consistently meet or exceed stated expectations over time.

Department/Program Outcomes:
1. Students will be able to use the scientific method.
2. Students will be able to express how science impacts everyday life.
3. Students will be able to evaluate the results of an experiment.

Student Learning Outcomes:
1. Student will be able to identify and draw organic compounds and functional groups, understand the organic nomenclature system and recognize common organic reactions.
2. Students will be able to identify the proteins, lipids, carbohydrates and understand the biological importance of these compounds.

Unit Objectives:
Unit 1: Describe the saturated hydrocarbon class of organic compounds.
   Objective 1: Draw and name simple alkanes and cycloalkanes, using the IUPAC nomenclature system.
   Objective 2: Predict and explain the general trends in the physical properties of alkanes and cycloalkanes.
   Objective 3: Draw and name structural isomers.
   Objective 4: Write equations of reactions for halogenation and combustion of alkanes.

Unit 2: Identify the important classes of unsaturated hydrocarbons; alkenes and aromatic.
   Objective 1: Draw structures of and name (IUPAC) alkenes and aromatic hydrocarbons.
   Objective 2: Predict, write structures of, and name simple structural and geometric isomers of alkenes.
   Objective 3: Predict and explain the general trends in the physical properties of alkenes and aromatic compounds.
   Objective 4: Write equations of reactions predicting products of the simple addition reactions of alkenes: hydrogenation, hydration, and hydrohalogenation.

Unit 3: Describe the organic families of ethers, thiols, and phenols.
   Objective 1: Draw structures of ethers, thiols, and phenols.
   Objective 2: Predict and explain the general trend in physical properties of ethers, thiols, and phenols.

Unit 4: Understand the organic family of alcohols.
Objective 1: Draw and name (IUPAC) simple alcohols.
Objective 2: Predict and explain the general trends in the physical properties of alcohols.
Objective 3: Classify alcohols as primary, secondary, or tertiary.
Objective 4: Write equations of reactions for the dehydration and oxidation of alcohols.

Unit 5: Understand the aldehyde and ketone families.
Objective 1: Write structures and names (IUPAC) of common aldehydes and ketones.
Objective 2: Describe and explain the physical properties of the aldehyde and ketone families.
Objective 3: Write equations of reactions for oxidation and reduction of aldehydes and ketones.
Objective 4: Write equations of reactions for the preparation of hemiacetals, hemiketals, acetalts, and ketals.

Unit 6: Describe the carbohydrate family.
Objective 1: Know the ways in which carbohydrates are classified.
Objective 2: Draw and name simple carbohydrates using Fischer and Haworth projections.
Objective 3: Use the concepts of optical activity, chirality, enantiomers, anomers, stereoisomers, D- and L- configuration, (+) and (-) configuration to describe carbohydrates.
Objective 4: Describe the chemical and biochemical properties of monosaccharides, oligosaccharides, and polysaccharides.

Unit 7: Identify carboxylic acids and esters.
Objective 1: Draw structures of and name (IUPAC) the common members of the carboxylic acid and ester families.
Objective 2: Predict and explain the general trends in physical properties of carboxylic acids and esters.
Objective 3: Write equations of reactions for the preparation of carboxylic acids and esters.
Objective 4: Write equations of reactions for the hydrolysis of esters.

Unit 8: Understand the lipid family.
Objective 1: List the common classes of lipids - describing the important structural features of each.
Objective 2: Predict and explain the physical properties of the common classes of lipids.
Objective 3: Write examples of synthesized triacylglycerides.
Objective 4: Write equations of reactions of triacylglycerides: esterification, hydrolysis, saponification, and hydrogenation.

Unit 9: Identify the amine and amide families.
Objective 1: Draw structures of and name (IUPAC) common amines and amides.
Objective 2: Predict and explain the physical properties of amines and amides.
Objective 3: Write equations of reactions preparing amines and amides.
Objective 4: Identify and describe the amide bond.
Objective 5: Write equations of reactions of amines and amides.

Unit 10: Describe amino acids and proteins.
Objective 1: Identify and describe the primary structure of proteins and the peptide bond.
Objective 2: Identify the secondary protein structure and the forces that maintain the secondary structure.
Objective 3: Identify and describe the tertiary and quaternary protein structure.
Objective 4: Predict and explain how extremes of pH and temperature cause denaturation of proteins.
Objective 5: Write the general structure of a amino acids.
Objective 6: Classify the side chains (R-groups) of the amino acids.

Unit 11: Demonstrate scientific process skills in a laboratory.
Objective 1: Observe by using the senses to obtain information or data about objects or events.
Objective 2: Measure by using numbers and equipment to quantify observations.
Objective 3: Classify by imposing order on collections of objects and events to show similarities, differences, and interrelationships.
Objective 4: Explore by looking into new and unknown situations.
Objective 5: Record logical quantification and manipulation of data.
Objective 6: Predict by formulating a specific forecast based on observations, measurements, and relationships among variables.
Objective 7: Infer by using logic to draw conclusions from data.
Objective 8: Hypothesize by formulating testable generalizations.
Objective 9: Solve problems by applying logical reasoning when faced with new or unique situations or when a need arises to troubleshoot laboratory procedural errors.
Objective 10: Experiment by using many process skills to conduct a "controlled" test of an hypothesis.
Objective 11: Make decisions by using pertinent data to draw logical conclusions.
Objective 12: Make value judgments by determining the relevance or ethical nature of data collected.
Objective 13: Report by writing reports based on many of the above skills that will include the purpose for the lab, all data/observations, any calculations needed to complete the purpose, any graphs and empirical equations necessary to illustrate the underlying theory and a conclusion that not only compares results but ties them to the theory and gives reasons for error.

Unit 12: Develop laboratory techniques and interpret chemical concepts.
Objective 1: View a safety video and discuss how to act safely and responsibly in the chemical laboratory.
Objective 2: Use the techniques of melting point determination, recrystallization, extraction, distillation, and chromatography.

Objective 3: Synthesize, purify, and identify an organic compound.

Objective 4: Research information about organic compound(s) using reference books, chemical literature, and the internet.

Objective 5: Identify an organic and biochemical compound using organic qualitative techniques.

College Procedures: All college-wide procedures are located in the Iowa Central Community College Student Handbook.

Assessments: Proctored assessments will account for at least 60% of the overall course grade. A proctored assessment is supervised by an approved, neutral person who ensures the identity of the test taker and the integrity of the test taking environment. See the assessment and/or grading policy section of the course policy for a listing of proctored assessments and their overall percentage of the course grade. Please note that assessments are subject to change.

Non-discrimination Statement:


If you have questions or complaints related to compliance with this policy, please contact Kim Whitmore, Director of Human Resources, phone number 515-574-1138, whitmore@iowacentral.edu; or the Director of the Office for Civil Rights, U.S. Department of Education, Citigroup Center, 500 W. Madison, Suite 1475, Chicago, IL 60661, phone number 312-730-1560, fax 312-730-1576.

Disability/Accommodation Services:

If you have a request for an accommodation based on the impact of a disability, it is Iowa Central's policy that you contact the Academic Assistance & Accommodations Coordinator to discuss your specific needs and to provide supporting information and documentation, so we may determine appropriate accommodations. The office for accommodations is located in the Academic Resource Center, and it can be reached by calling 515-574-1045. For online information about accommodations, please go to www.iowacentral.edu/accommodations.
Bias-Free Classroom Statement:

(Insert course name) maintains high standards of respect in regard to individual beliefs and values when selecting classroom materials including textbooks, project activities, power points, videos, presentations, and classroom discussions.

It is our belief that all people have the right to obtain an education within our department/program courses free of bias, with full respect demonstrated to all who enroll in the courses of this department/program.
Course Name: **Introductory Biology**  
Instructor Name: 
Course Number: BIO 105  
Course Department: Science  
Course Term:  
Last Revised by Department: July 2017  
Total Semester Hour(s) Credit: 4  
Total Contact Hours per Semester: 

**Lecture: 45  Lab: 30  Clinical:  Internship/Practicum:**

Catalog Description: An introduction to the science of biology. This course is designed for students who are not majoring in biology or health related fields. Topics include scientific method, diversity of life, genetics, ecology and evolution. Students will learn to plan, conduct, analyze, and interpret simple experiments in biology. Critical thinking will be a major emphasis throughout the lab. This course satisfies a general education requirement in the Math/Science area. Three hours lecture, two hours lab.

Pre-requisites and/or Co-requisites:


Access Code: Access code may be needed for this class (each instructor will make this determination and inform the bookstore)

Materials Required:

Suggested Materials:

Institutional Outcomes:

Critical Thinking: The ability to dissect a multitude of incoming information, sorting the pertinent from the irrelevant, in order to analyze, evaluate, synthesize, or apply the information to a defendable conclusion.

Effective Communication: Information, thoughts, feelings, attitudes, or beliefs transferred either verbally or nonverbally through a medium in which the intended meaning is clearly and correctly understood by the recipient with the expectation of feedback.
Personal Responsibility: Initiative to consistently meet or exceed stated expectations over time.

Department Outcomes:
1. Students will be able to use the scientific method.
2. Students will be able to express how science impacts everyday life.
3. Students will be able to evaluate the results of an experiment.

Student Learning Outcomes:
1. Students will evaluate the theory of evolution.
2. Students will interpret the structure and function of living systems.
3. Students will examine information flow, exchange, and storage within a living system.
4. Students will compare and contrast pathways and transformations of energy and matter within living systems.
5. Students will evaluate emergent properties of living systems at various levels

Unit Objectives:
Unit 1: Biology and the Living World
   Objective 1: Describe the 6 kingdoms of life.
   Objective 2: Describe the five basic properties all living organisms share.
   Objective 3: Describe the levels of complexity of living organisms.

Unit 2: The Scientific Process
   Objective 1: Describe the stages of scientific investigation.
   Objective 2: Describe the difference between hypothesis and theory.
   Objective 3: Differentiate between science and pseudoscience.

Unit 3: Simple Chemistry
   Objective 1: Define an atom and its chemical properties.
   Objective 2: Describe the difference between an ion and an isotope.
   Objective 3: Describe a molecule and the different bonds that exist.

Unit 4: Macromolecules
   Objective 1: Describe the term macromolecule.
   Objective 2: Describe the following macromolecules: carbohydrates, proteins, lipids, and nucleic acids.

Unit 5: Nature of cells
   Objective 1: Describe the principles of cell theory.
   Objective 2: Describe the organization and function of a prokaryotic cell parts.
   Objective 3: Describe the organization and function of a eukaryotic cell parts.
Unit 6: Flow of energy through living things
Objective 1: Describe how enzymes function.
Objective 2: Describe ATP and the role it plays in metabolism.
Objective 3: Describe the steps of the light dependent and independent reactions.
Objective 4: Describe the process of cellular respiration, including glycolysis, the citric acid cycle, and electron transport chain.

Unit 8: Cell cycle, chromosomes, cell division and cancer
Objective 1: Describe the process of binary fission as used by prokaryotic cells.
Objective 2: Describe each stage of the cell cycle.
Objective 3: Describe the difference between homologous chromosomes and sister chromatids.
Objective 4: Describe how the cell cycle relates to cancer.
Objective 5: Describe the difference between asexual and sexual reproduction.

Unit 9: Reproduction, meiosis, and the evolutionary consequences of sex
Objective 1: Compare and contrast haploid and diploid cells.
Objective 2: List the ways in which meiosis differs from mitosis.
Objective 3: Describe the process and significance of crossing over.

Unit 10: Heredity, and human heredity disorders
Objective 1: Perform monohybrid crosses using a Punnett square and be able to express probability outcomes of these crosses.
Objective 2: Describe how the genotype affects phenotype.
Objective 3: Describe how each of the types of complex inheritance differ from Mendelian genetics.
Objective 4: Define sex-linked traits and be able to perform Punnett square problems that exhibit sex-linked traits.
Objective 5: Describe non-disjunction and its outcomes.
Objective 6: Describe common autosomal and sex-linked genetic disorders.

Unit 11: Central dogma of biology
Objective 1: Describe the basic structure of DNA and its constituents.
Objective 2: Describe DNA synthesis.
Objective 3: Describe mutations.
Objective 6: Describe how genomic information is used.

Unit 12: Gene technology, genomics, and cell technology
Objective 1: Describe how genetic engineering is used in medicine and agriculture.
Objective 2: Describe the primary techniques used by genetic engineers.
Objective 3: Describe the mechanisms of cloning.
Objective 4: Describe how stem cells are used in modern medicine.
Objective 5: Describe PCR and gel electrophoresis.

Unit 13: Evolution and natural selection
Objective 1: Describe the evidence for evolution that is reflected in anatomy, molecular biology, and paleontology.
Objective 2: List the mechanisms of evolution.
Objective 3: Describe how symbiotic relationships aid organisms in changing to live in an environment.
Objective 4: Describe how plant and animals evolve methods of defense to insure the species continues.

Unit 14: Animals, the evolution of animal phyla, and an overview of the vertebrates.
Objective 1: List and briefly describe the general features of animals.
Objective 2: Distinguish between the different body plans of animals.

Unit 15: Ecology
Objective 1: List the levels of ecological organization.
Objective 2: Compare exponential and logistic growth and describe how they relate to a population’s carrying capacity.
Objective 3: Define niche and competition.
Objective 4: Describe resource partitioning and how it aids organisms to live in an area.

Unit 16: Ecosystems
Objective 1: Define what an ecosystem is and how the concepts of habitat and community are related to the ecosystem.
Objective 2: Describe the difference between a food chain and a food web.

Unit 17: Global impact of humans on the world
Objective 1: Interpret data presented regarding global issues.
Objective 2: Examine how biodiversity can be impacted by habitat loss, overexploitation, and introduced species.
Objective 3: Describe the factors responsible for extinction.

Unit 18: Understand how to prepare a science report.
Objective 1: Organize reports according to the proper format.
Objective 2: Communicate the necessary information succinctly and logically, both orally and in writing.
Objective 3: Minimize spelling, typographical, and numerical errors in submitted reports.

Unit 19: Apply various investigative methods in the conduction of biological studies.
Objective 1: Use a microscope when needed, and do so properly.
Objective 2: Use the scientific method in the laboratory.
Objective 3: Report measurements using the metric system, and be able to convert between U.S. and metric systems.

Unit 20: Demonstrate an understanding of the characteristics of life.
   Objective 1: List the characteristics of life.
   Objective 2: Use the theory of evolution to explain the unity and diversity of life.
   Objective 3: State taxonomic classification categories.
   Objective 4: Relate findings to general principles and theories.

Unit 21: Organize and participate in team work in an effective manner.
   Objective 1: Communicate to team members the goals and procedures of the experiment at hand.
   Objective 2: Assign tasks to team members to complete the study in the most effective manner.
   Objective 3: Carry on assigned tasks properly and efficiently.
   Objective 4: Communicate to team members possible problems with the procedure or the results and offer potential solution.

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Bias-Free Classroom Statement:

Introductory Biology maintains high standards of respect in regard to individual beliefs and values when selecting classroom materials including textbooks, project activities, power points, videos, presentations, and classroom discussions.

It is our belief that all people have the right to obtain an education within our department/program courses free of bias, with full respect demonstrated to all who enroll in the courses of this department/program.
The Math Department is proposing updating our current three credit hour MAT-226 Differential Equations with Laplace Transforms course to a four-credit hour MAT-267 Elementary Differential Equations with Laplace Transforms. This update is meant to align the course with students’ primary transfer school Iowa State University. The current three credit hour course leaves students one math credit short after transferring given Iowa State’s four credit hour course. For this update, the student learning outcomes have been rewritten to give a better balance of unit objectives across the outcomes. Most of the unit objectives remain the same with some numerical methods removed and some power series solutions added. The unit objectives have been chosen to be in-line with Iowa State’s course.

Articulation Concerns:
ISU, U of I, UNI, and BVU all have approved the course for transfer for their Differential Equations course.

Department Vote:
Approved by the Math Department.

Division Vote:
Approved by the STEMM Division.
Course Syllabus

Course Name: Business Computing

Course Prefix and Number: CSC 116

Course Department: Business Department

Course Term: Fall 2019

Last Revised by Department: Spring 2019

Total Semester Hour(s) Credit: 3

Total Contact Hours per Semester:

Lecture: 45 Lab: Clinical: Internship/Practicum:

Catalog Description:
This course presents the basic concepts of information systems and computer literacy. The course incorporates theory as well as hands-on practice which focuses on spreadsheets and database management systems (DBMS).

Pre-requisites and/or Co-requisites: None

Textbook(s) Required:

Access Code:

Materials Required:

Suggested Materials:

Institutional Outcomes:

Critical Thinking: The ability to dissect a multitude of incoming information, sorting the pertinent from the irrelevant, in order to analyze, evaluate, synthesize, or apply the information to a defensible conclusion.
Effective Communication: Information, thoughts, feelings, attitudes, or beliefs transferred either verbally or nonverbally through a medium in which the intended meaning is clearly and correctly understood by the recipient with the expectation of feedback.

Personal Responsibility: Initiative to consistently meet or exceed stated expectations over time.

Department Outcomes:
1. Apply effective business or career-related communication.
2. Demonstrate business or career-related human relations skills.
3. Solve business or career-related problems.

Student Learning Outcomes/Unit Objectives:

1. Basic computer literacy in word processing, presentation, spreadsheet, and DBMS theory and application
2. Intermediate application skills in spreadsheet applications
3. Intermediate application skills in DBMS applications
4. Introduction to information system concepts

Spreadsheets
1. Introduction to Spreadsheets
2. Designing and Creating
3. Formatting
   a. Cell
   b. Sheet
   c. Conditional
4. Cell Referencing
   a. Relative
   b. Absolute
   c. 3D
5. Formulas and Functions
   a. DATE/TIME
   b. SUM
   c. AVERAGE
   d. COUNT
   e. COUNTA
   f. MIN
   g. MAX
   h. SUMIF
   i. COUNTIF
   j. IF
   k. VLOOKUP
I. Financial Functions (PMT, NPV)

6. Chart
   a. Line and Pie
   b. Chart Components
      i. Data Labels
      ii. Data Point
      iii. Data Series

7. Pivot Tables and Pivot Charts

8. What-if Analysis
   a. Goal seek
   b. Scenario manager

9. Data Tables and Filtering

10. Importing and Exporting Data

Database

1. Introduction to Database Management Systems (DBMS)
   a. Conceptual understanding of a DBMS
   b. Conceptual understanding of SQL
   c. Overview of a Relational Database
      i. Byte – Field – Record – Table
      ii. Data Types
   d. Overview of Microsoft Access

2. Creating a Database in Microsoft Access
   a. Table – Datasheet and Design View
      i. Field Properties (metadata)
         1. Data Types
         2. Format (casing, currency, phone #, etc.)
         3. Input Mask
         4. Validation Rule and Text
   b. Relationships—Database Tools
      i. Primary and Foreign Keys
   c. Managing Records—Inserting, Updating, Deleting
   d. Importing and Exporting Data
   e. Compacting and Repairing—Database Tools

3. Querying in Microsoft Access
   a. Single and Cross-Table queries
   b. Criteria using Operators
      i. Relational and Conditional (>, >=, <, <=, =, <>)
      ii. Logical (BETWEEN, OR, AND)
      iii. Wildcard Operator (*)
   c. Expressions/Calculations
      i. Use of aggregate functions
      ii. Use of group by
      iii. Calculated Fields
   d. Exporting Data

4. Creating Forms in Microsoft Access using Wizards
a. Sub-Forms
5. Creating Reports in Microsoft Access using Wizards

Document Processing
1. Introduction to Microsoft Word
2. Create a document in Word that displays graphs and charts

Presentation
1. Introduction to Microsoft PowerPoint
2. Create a presentation in PowerPoint that displays graphs and charts

Conceptual Material
1. Components of an Information System (IS)
   a. Compare IS to Information Technology (IT)
   b. Hardware and Software
   c. Web-based and Mobile Devices
2. Development and Acquisitions of IS
   a. Methodologies
3. Cloud-based IS
   a. Advantages and disadvantages
4. Strategies in IS
   a. Impact on organizational operations
   b. Contributions to competitive advantage
5. IS Security
   a. Security threats
   b. Security measures
6. Business Intelligence
   a. Support decision making

College Procedures: All college-wide procedures are located in the Iowa Central Community College Student Handbook.

Assessments:

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Bias-Free Classroom Statement:

The Intro to Accounting course, part of the Accounting Associate and Numbers at Night Programs maintains high standards of respect in regard to individual beliefs and values when selecting classroom materials including textbooks, project activities, power points, videos, presentations, and classroom discussions.

It is our belief that all people have the right to obtain an education within our department/program courses free of bias, with full respect demonstrated to all who enroll in the courses of this department/program.

Opt Out Policy: Cengage Unlimited:

As a part of this class, we will be utilizing online text books and resources provided to us by Cengage Unlimited. This is a digital learning subscription that gives you access to your Cengage courses through platforms like SAM, MindTap and WebAssign, ebooks, study guides and a free digital locker. This access has been included with this course as a course fee. If you wish to “opt-out” of this course fee, and wish to purchase all required textbooks and class resources individually, please contact your instructor to get a copy of the Opt-Out Form. This form must be completed and turned in by 5pm at the end of the Add/Drop period (first 5 days of school). The student will then be responsible for purchasing all required textbooks and resources on their own. If for any reason you have not received your textbook(s) on time, it is not the responsibility of Iowa Central Community College (both faculty and staff) to provide extenuating accommodations to you. For more information, please ask your instructor.
Thank you for sending a beautiful plant at the time of our loss. We are sorrowful that she is no longer with us, but she is in heaven, no more pain, nor sadness.

[Signature]
Linda (Wood) Scott
Jennifer (Wood) Rolland

Thank you sincerely for sharing our sorrow.

Your kindness is deeply appreciated and will always be remembered.

The family of
Velma Wood
grandmother of Christel Becker

Dear Jaus Central Community College,

Thank you for the $300 scholarship you so graciously donated to Jesus Lutheran Church’s rummage sale and silent auction. Your generous donation helped us raise nearly $500 for scholarships for our Companion Congregation in Tanzania.

Sincerely,
Jesus Lutheran Church
Rummage Sale Committee
Jim Kersten  
1 Triton Cir  
Fort Dodge, IA 50501

Dear Jim,

Thank you for organizing the ag roundtable and for the opportunity to speak to students and leaders in Fort Dodge. It is always a pleasure getting to talk with agriculture leaders and learn about their thoughts. I also appreciate the opportunity to visit a community college and meet with the future leaders of our industry.

Thank you again. If my office can ever do anything to assist you, please do not hesitate to reach out.

Sincerely,

Mike Naig  
Secretary of Agriculture

MN: mlv

Thanks again Jim!