Project Manual
Issued: February 19, 2019

Project
DAWSON COUNTY PAVILION
Dawsonville, Georgia

Owner
Dawson County Board of Commissioners
25 Justice Way, Suite 2223
Dawsonville, GA 30534

Architect and Interior Designer
Wakefield Beasley & Associates Architects, Inc.
5200 Avalon Boulevard
Alpharetta, GA 30009

Mechanical, Electrical, Plumbing, & Fire Protection
Griffith Engineering, Inc.
4360 Chamblee Dunwoody Road
Suite 210
Atlanta, GA 30341

Civil/Landscape
Foresite Group, Inc.
3740 Davinci Ct
Suite 100
Peachtree Corners, GA 30092

Structural
Shear Structural
931 Monroe Drive,
Atlanta, GA 30308

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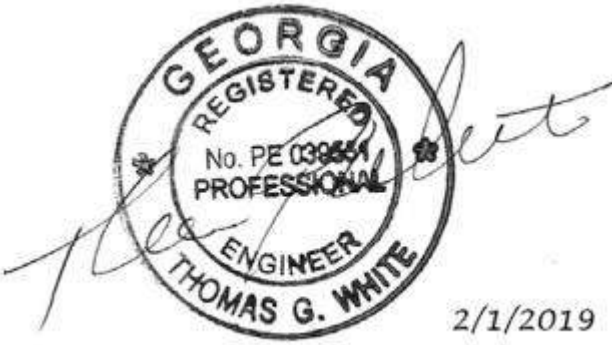
SECTION 000107 - DOCUMENT SEALS

CIVIL

MECHANICAL/PLUMBING/FIRE PROTECTION

ARCHITECTURE/KITCHEN

ELECTRICAL



STRUCTURAL

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SECTION 00 01 10 - TABLE OF CONTENTS

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(Note: Divisions 00 thru 49 not listed above are not used or in this cover.)

END OF SECTION 00 01 10

DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

C. An addendum to the Soil-boring data for the Project, obtained by Geo-Hydro Engineers, Inc., dated February 15, 2019, is available for viewing as an appendix to this Document.

D. A full geotechnical investigation report for Project, prepared by Geo-Hydro Engineers, Inc., dated April 3, 2018 is available for viewing as an appendix to the Dawson County Senior Center Package.

1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 003132

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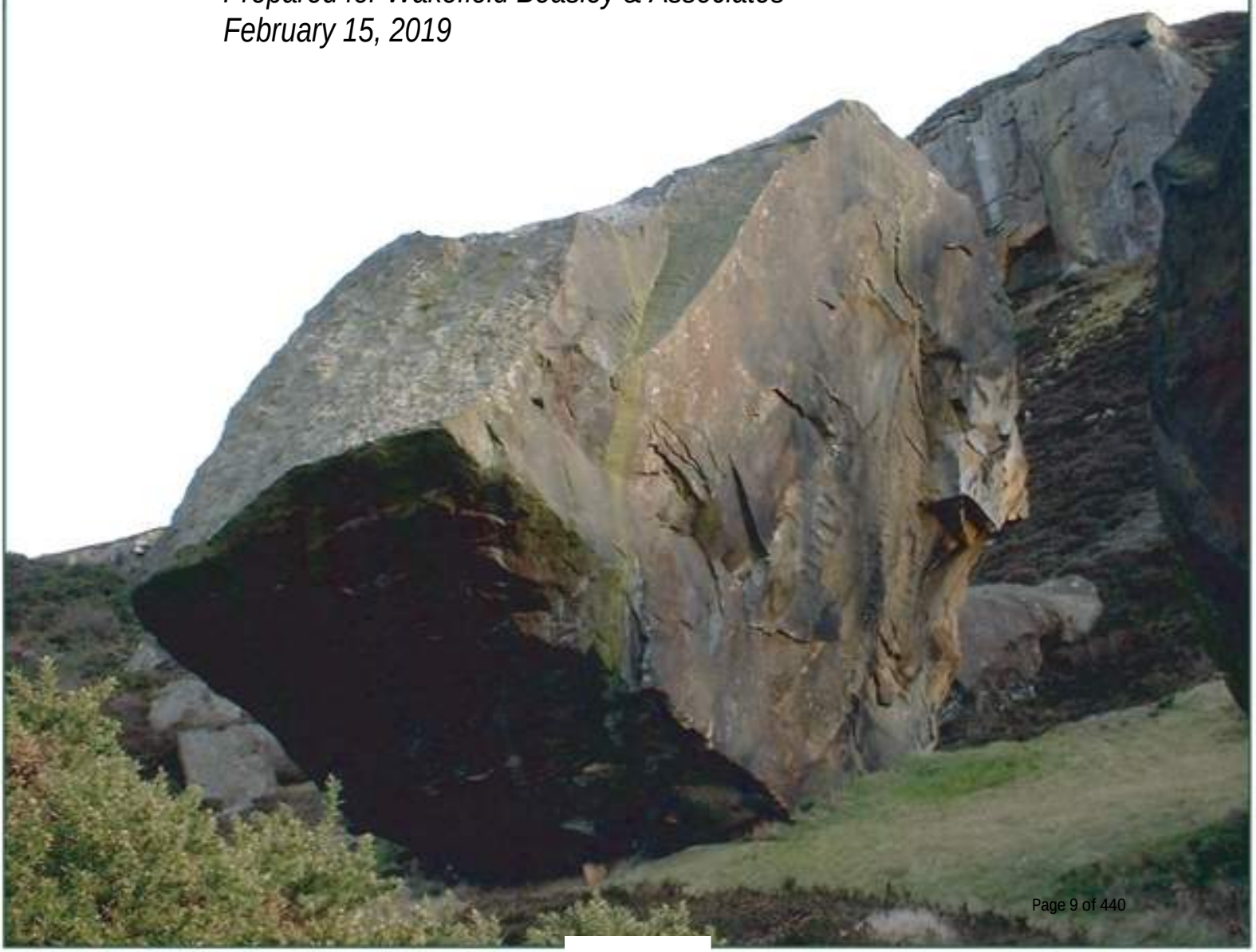
GEO HYDRO ENGINEERS

Addendum 1 to Report of Subsurface Exploration and Geotechnical Engineering Evaluation

Dawson County Senior Center Expansion
Veterans Memorial Park
Dawsonville, Georgia
Geo-Hydro Project Number 180267.20

Prepared for Wakefield Beasley & Associates
February 15, 2019



Ms. Christian Springfield
Wakefield Beasley & Associates
A NELSON Company
5200 Avalon Boulevard
Alpharetta, Georgia 30009

February 15, 2019

Addendum 1 to Report of Subsurface Exploration
and Geotechnical Engineering Evaluation
Dawson County Senior Center Expansion
Veterans Memorial Park
Dawsonville, Georgia
Geo-Hydro Project Number 180267.20

Dear Ms. Springfield:

Geo-Hydro Engineers, Inc. has previously performed a subsurface exploration for the above referenced project, the results of which can be found in our *Report of Subsurface Exploration and Geotechnical Engineering Evaluation* dated April 3, 2018.

The total project includes a new senior center and a new pavilion separated by a new parking lot. In general, the ground surface within the construction area slopes down to the southwest from Recreation Road. The finished floor elevations will be at the approximate elevation of Recreation Road, and site grading within the building and parking lot footprints is expected to involve as much as 20 feet of structural fill placement. The project grading plan includes up to 10 feet of mass excavation within the existing ball field northeast of the project area to generate the fill material necessary to construct the building pads.

Our April 2018 report addressed only the senior center building and eastern half of the proposed parking lot due to funding limitations at the time of our authorization. The purpose of this addendum is to address the pavilion and remainder of the parking lot.

- The grading plan provided to us shows a new detention pond to be constructed at the southwestern edge of the construction area. Constructing the pond will involve up to 15 feet of mass excavation. Although the borings performed at the top of the slope do not suggest that partially weathered rock or rock will be encountered, it is important to note that the depth to partially weathered rock or rock can vary drastically over relatively short distances in the Piedmont. We recommend performing test pits within the pond footprint once the area is accessible. Identifying rock or partially weathered rock at the onset of site grading will provide the design team an opportunity to adjust the geometry of the pond to reduce the amount of ripping or blasting while maintaining the volume necessary for the project stormwater design.

- Due to access limitations, our previous exploration within the senior center expansion footprint consisted of two hand auger borings. Both hand auger borings encountered residual soil within a foot of the ground surface, suggesting that extensive subgrade stabilization will not be necessary to facilitate structural fill placement within the building footprint. It is important to note that no exploration has been performed within the pavilion footprint. At the onset of construction, hand auger borings,

observations, or a shallow test pit exploration should be conducted to evaluate near-surface materials within the pavilion footprint prior to mass grading.

Except as noted above, the evaluations and recommendations presented in our April 2018 report should be considered applicable to the entire project including the pavilion and remainder of the parking lot. The following discussions are reiterated in this addendum for convenience.

- Borings B-2, B-3, and B-4 were performed within the planned multi-use field where excavated soils are planned to be reused as structural fill within the new senior center, pavilion, and parking lot footprints. The fill materials encountered in the borings contained varying amounts of topsoil and roots. In general, the composition of the fill materials suggests a lack of quality control. This is a common occurrence within athletic fields, which are typically considered non-structural areas during mass grading for most projects. It is important to note that the fill materials are in inherently variable and the composition of fill materials will vary through the fill mass. Some of the existing fill materials will not be suitable for reuse as structural fill. We recommend identifying a suitable, alternate borrow source prior to construction to supplement the planned borrow source as needed. Our April 2018 report provides additional discussion on potential effects related to the uncontrolled fill within the athletic field. At the onset of grading, a test pit evaluation within the planned borrow area will aid in planning and estimating the additional fill necessary from off site.

- Contingent upon proper site preparation and thorough evaluation of the foundation excavations, it is our opinion that the proposed senior center building and pavilion can be supported using conventional shallow foundations and concrete slab-on-grade floors. For design purposes, we recommend an allowable bearing pressure of 3,000 psf. This recommendation is based on a maximum column load of 50 kips and a maximum all load of 2 kips per lineal foot. If actual design loads exceed these assumed maximums, please allow us the opportunity to revise our recommendations as necessary.

We appreciate the opportunity to serve as your geotechnical consultant for this project and are prepared to provide any additional services you may require. If you have any questions concerning this report or any of our services, please call us.

Sincerely,

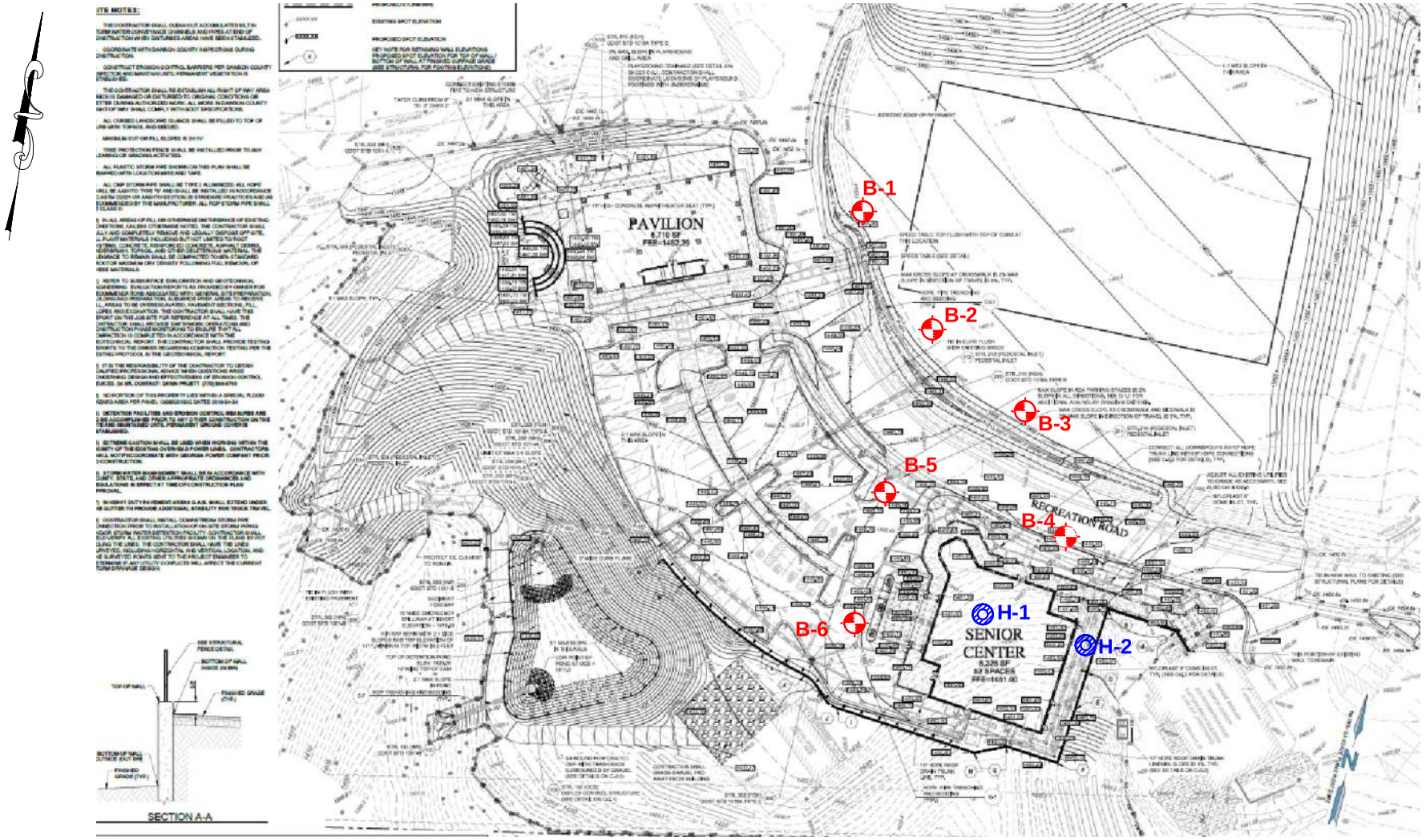
GEO-HYDRO ENGINEERS, INC.

A. Marty Peninger, P.E.
Senior Geotechnical Engineer
mpeninger@geohydro.com

Luis E. Babler, P.E.
Chief Engineer
luis@geohydro.com

AMP/LEB/180267.20 - Dawson County Senior Center Expansion - Addendum 1 to Geotechnical Report

APPENDIX



Approximate Scale: 1"=100'

LEGEND: Soil Test Boring
Hand Auger Boring

Boring Location Plan

Dawson County Senior Center Expansion
Veterans Memorial Park
Dawsonville, Georgia
Geo-Hydro Project Number 180267.20

Symbols and Nomenclature

Symbols

▌	Thin-walled tube (TWT) sample recovered
▯	Thin-walled tube (TWT) sample not recovered
●	Standard penetration resistance (ASTM D1586)
50/2”	Number of blows (50) to drive the split-spoon a number of inches (2)
65%	Percentage of rock core recovered
RQD	Rock quality designation - % of recovered core sample which is 4 or more inches long
GW	Groundwater
	Water level at least 24 hours after drilling
	Water level one hour or less after drilling
ALLUV	Alluvium
TOP	Topsoil
PM	Pavement Materials
CONC	Concrete
FILL	Fill Material
RES	Residual Soil
PWR	Partially Weathered Rock
SPT	Standard Penetration Testing

Penetration Resistance Results	Number of Blows, N	Approximate Relative Density
Sands	0-4	very loose
	5-10	loose
	11-20	firm
	21-30	very firm
	31-50	dense
	Over 50	very dense

	Number of Blows, N	Approximate Consistency
Silts and	0-1	very soft
Clays	2-4	soft
	5-8	firm
	9-15	stiff
	16-30	very stiff
	31-50	hard
	Over 50	very hard

Drilling Procedures

Soil sampling and standard penetration testing performed in accordance with ASTM D 1586. The standard penetration resistance is the number of blows of a 140-pound hammer falling 30 inches to drive a 2-inch O.D., 1.4-inch I.D. split-spoon sampler one foot. Rock coring is performed in accordance with ASTM D 2113. Thin-walled tube sampling is performed in accordance with ASTM D 1587.

B-1

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1450**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Asphalt (Approximately 3 inches)	
				Graded Aggregate Base (Approximately 4 inches)	
				Orange to dark brown silty fine sand (SM) with rock fragments, wood, and wire (FILL)*	14
1445	5				30
					12
				Firm purple-brown to dark brown silty fine sand (SM) (RESIDUUM)	
1440	10				14
1435	15			Boring Terminated at 15 feet	15
1430	20				
1425	25				
1420	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks: *Standard penetration resistance not considered representative due to rock fragments in the fill

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

B-2

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1460**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Topsoil (Approximately 2 inches)	
				Stiff orange-brown silty clay (CL) (FILL)	9
1455	5				9
				Firm gray silty clay (CL) with topsoil (FILL) (WET)	8
				Very dense tan highly micaceous silty fine sand (SM) (RESIDUUM)	
1450	10				66
				Very firm orange-brown silty fine sand (SM)	
1445	15			Boring Terminated at 15 feet	27
1440	20				
1435	25				
1430	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

B-3

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1460**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Topsoil (Approximately 2 inches)	
				Stiff orange and dark gray silty clay (CL) with topsoil (FILL)	10
1455	5			Stiff orange silty clay (CL) (RESIDUUM)	15
				Very firm purple-brown micaceous silty fine sand (SM)	23
1450	10			Very firm to dense brown silty fine sand (SM)	32
1445	15			Boring Terminated at 15 feet	21
1440	20				
1435	25				
1430	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

B-4

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1460**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Topsoil (Approximately 2 inches)	
				Firm orange-brown silty clay (CL) (FILL)	5
				Very stiff orange-brown silty clay (CL) (FILL)	
1455	5				22
				Stiff dark gray silty clay (CL) with topsoil and roots (FILL)	9
				Firm purple-brown silty fine sand (SM) (RESIDUUM)	
1450	10				19
				Dense purple and brown silty fine sand (SM)	
1445	15				45
				Firm purple-brown micaceous silty fine sand (SM)	
1440	20			Boring Terminated at 20 feet	16
1435	25				
1430	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

B-5

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1448**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
1448	0			Gravel (Approximately 3 inches)	
				Very firm to dense orange-brown micaceous silty fine sand (SM) (RESIDUUM)	21
1445	5				31
					20
1440	10				22
				Boring Terminated at 10 feet	
1435	15				
1430	20				
1425	25				
1420	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

B-6

Test Boring Record

GEO HYDRO ENGINEERS

Project: **Dawson County Senior Center Expansion**		Project No: **180267.20**
Location: **Veterans Memorial Park - Dawsonville, Georgia**		Date: **3/21/18**
Method: **HSA- ASTM D1586**	GWT at Drilling: **Not Encountered**	G.S. Elev: **1444**
Driller: **GCD (Rope & Cathead)**	GWT at 24 hrs: **N/A (Boring Backfilled)**	Logged By: **AMP**

Elev. (Ft)	Depth (Ft)	GWT	Symbol	Description	N
				Gravel (Approximately 4 inches)	
				Very stiff red fine sandy silt (ML) (RESIDUUM)	17
1440				Firm red-brown to gray micaceous silty fine sand (SM)	
	5				20
					15
1435					
	10			Boring Terminated at 10 feet	14
1430					
	15				
1425					
	20				
1420					
	25				
1415					
	30				

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

Remarks:

TEST BORING RECORD DAWSON SENIOR CENTER BORINGS.GPJ GEO HYDRO.GDT 4/3/18

HAND AUGER LOG H-1

Date Performed: 3/21/18 Logged by: AMP

Equipment: Hand Auger and Penetrometer Elevation(ft): 1438

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE	PEN. RESIST	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	LAB TESTS
		Topsoil (Approximately 4 inches)		2			
1		Orange-brown fine sandy silt (ML) (RESIDUUM)					
2				5			
3		Orange-brown silty fine sand (SM)					
4				17			
5		Tan-brown micaceous silty fine sand (SM)					
6		Hand Auger Terminated at 6 feet		>25			
		No Groundwater Encountered					
7							
8							
9							

HAND AUGER LOG H-2

Date Performed: 3/21/18 Logged by: AMP

Equipment: Hand Auger and Penetrometer Elevation(ft): 1432

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE	PEN. RESIST	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	LAB TESTS
		Topsoil (Approximately 1 inch)		>25			
1		Dark brown silty fine sand (SM) with rock fragments (FILL)					
		Orange-brown fine sandy silt (ML) (RESIDUUM)					
2				7			
3		Orange-brown silty fine sand (SM)					
4				20			
5		Tan and orange micaceous silty fine sand (SM)					
6		Hand Auger Terminated at 6 feet		16			
		No Groundwater Encountered					
7							
8							
9							

Penetration resistance was evaluated in accordance with ASTM STP-399. The penetration resistance is the number of blows of a hammer weighing 15 lbs. falling 20 inches to drive a 1.5 inch diameter cone 1.75 inches.

Dawson County Senior Center Expansion
Veterans Memorial Park - Dawsonville, Georgia
180267.20

HAND AUGER DAWSON SENIOR HAND AUGER.GPJ LOG A GNNN07.GDT 4/3/18

DOCUMENT 003134 – STORMWATER MANAGEMENT REPORT

1.1 STORMWATER MANAGEMENT REPORT

A. The Stormwater Management Report was prepared by Foresite Group, Inc. and is dated June 2, 2018 with Revision 1: February 18,2019 and is available for viewing as an appendix to this document.

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STORMWATER MANAGEMENT REPORT

PROJECT: Dawson County Senior Center
SITE LOCATION: 201 Recreation Rd, Dawsonville, GA 30534

June 2nd, 2018
Revision 1: February 18, 2019

PREPARED FOR:

Dawson County

PREPARED BY:
Jack Johnson, PE, LEED AP

FORESITE group

Foresite Group, Inc.
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Norcross, Georgia 30092
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TABLE OF APPENDICES

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The project site is located in Dawson County, GA at 201 Recreation Road (Parcel ID 091035). The project site is located in Veterans Memorial Park, area owned by the county with the purpose of providing recreation area for county residents. The project site currently consists of a play-ground, an existing shed and undeveloped wooded area. Adjacent to the project site is the existing senior center which is to remain. The site drains to the southwest, where water discharges off-site into an unnamed tributary of Burt Creek.

A Vicinity Map can be seen in **Figure 1** below. Based on FIRM Panel 13085C0103C, dated April 4, 2018, no portion of the site is located within the floodplain. The FIRM Panel is included in Appendix A.

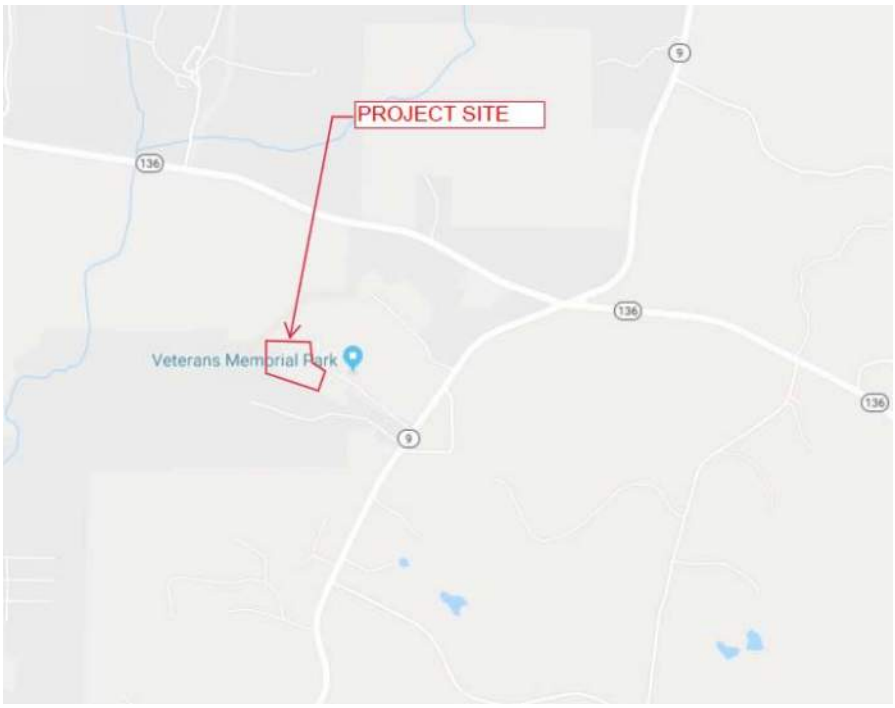


Figure 1 – Vicinity Map

The proposed construction includes an 8,326 square foot senior center, pavilion and all related infrastructure. The site will drain to an on-site stormwater detention pond designed to provide detention and water quality for the disturbed site area and a portion of park land. Stormwater is subsequently discharged from the stormwater detention pond off-site to an unnamed tributary of Burt Creek.

1.2 PURPOSE

The purpose of this report is to document the information and methods used to meet the stormwater management requirements set forth in the Dawson County, GA Code of Ordinances.

To meet the requirements set forth in the Dawson County Code of Ordinances, Article VI – Regulating Storm Water Management, the following procedures were performed:

- Hydrologic analyses
  - Pre-developed conditions (Sec. 109-143.c.C)
  - Developed conditions (Sec. 109-143.c.D)
- Water quality (WQv) analysis (Sec. 109-144.a)
- Stormwater detention analysis
  - One-year channel protection (CPv) analysis (Sec. 109-144.b)
  - Attenuation of the 2- through 25-yr, 24 hour events (Sec. 109-144.c)
- Safely convey the 100-yr, 24-hr storm event such that flooding is not exacerbated (Sec. 109-144.d)
- Downstream (10%) analysis (Sec. 109-143.c.F)
- Operations and Maintenance Plan (Sec. 109-143.c.I)

1.3 SUMMARY OF CONCLUSION

Based on the referenced construction drawings, the results of this analysis indicate that the proposed stormwater management facility constructed on the subject parcel will satisfy the stormwater management requirements set forth by the Dawson County Code of Ordinances.

2 HYDROLOGIC ANALYSIS

The hydrologic portion of this study was performed with the SCS TR-20 method. SCS 24 hour, Type II rainfall hyetographs were multiplied by the 1, 2, 5, 25, 50 and 100 year storm depths and convolved with the SCS Unit Hydrograph (shape factor 484) with area, Curve Number, and Time of Concentration parameters to produce direct runoff hydrographs.

According to a Soil Report for Dawson County, Georgia obtained from the NRCS, the soils within the basin analyzed are classified as Hydrologic Soil Group B. The Soil Map is included in Appendix A to this report.

The stormwater models for pre and post-developed conditions were created using Autodesk Hydraflow Hydrographs 2015.

2.1 PRE-DEVELOPED CONDITIONS

Drainage basins have been delineated for the pre-developed condition (a Pre-Developed Drainage Area Map is included in Appendix A to this report; the watershed parameters for all basins, including Curve Number and time of concentration calculation are included in Appendix B to this report).

Pre-Developed Basin A includes 6.13 acres of mostly pervious area, including a grassed baseball field and undisturbed woods. Some impervious area exists in Pre-Developed Basin A consisting of an entrance road, parking and asphalt trails. Runoff from this basin drains as overland flow and channel flow towards the southwestern corner of the property (Study Point #1).

Pre-Developed Basin B includes 4.18 acres of mostly pervious including a baseball field and undisturbed woods. Some impervious area exists in Pre-Developed Basin B consisting of the existing senior center, parking lot and entrance road. Runoff from this basin drains as overland flow and channel flow towards the southern property line (Study Line #2).

Pre-Developed Basin C includes 0.14 acre of mostly undisturbed woods. S. Runoff from this basin drains as overland flow and channel flow to the north (Study Line #3).

2.2 POST-DEVELOPED CONDITIONS

Three drainage basins have been delineated for the post-developed condition and are described below (a Post-Developed Conditions Drainage Area Map is included in Appendix A to this report; the watershed parameters for all basins, including Curve Number and time of concentration calculation are included in Appendix B to this report).

Post-Developed Basin A1 includes 6.55 acres consisting of the proposed senior center, pavilion and associated driveways, parking lot, some open landscaped area, and recreation fields across

Recreation Rd. Runoff from this basin will drain to the proposed stormwater management facility. From the stormwater management facility, runoff will then be discharged to the southwest of the subject site (Study Point #1) into an unnamed tributary of Burt Creek, see table in Appendix B for curve numbers.

Post-Developed Basin A2 (Bypass) includes 3.1 acres of mostly wooded area. Runoff from this basin will bypass the proposed pond and drain as overland flow to the southwestern corner of the property (Study Point #1), into an existing culvert leading to Burt Creek, see table in Appendix B for curve numbers.

Post-Developed Basin B (Bypass) includes 0.79 acre consists of wooded area, landscaped area, and impervious area from the existing senior center and parking lot. Runoff from this basin drains as overland flow to Study Line #2. See table in Appendix B for curve numbers.

*Note that there is no Post-Developed Basin C. Due to the proposed grading and construction improvements the area included in Pre-Developed Basin C will drain into Post-Developed Basin A1 and is included in Post-Developed Basin A1 area indicated above.

3 STORMWATER MANAGEMENT

An above ground stormwater management facility will be graded on the southwestern portion of the subject site in order to facilitate an adequate amount of volume to route the excess stormwater generated by the proposed building, drives, and parking areas. This will provide the required volume for detention, extended dry detention for water quality, and channel protection to meet Dawson County code requirements.

3.1 WATER QUALITY (Sec. 109-144.a)

A volume was calculated for Water Quality ("First-Flush") which is currently 1.2" per square foot of site area. This volume (10,414 cubic feet required, 16,563 cubic feet provided) will be routed through a 2.0" orifice drilled into an end cap to a 6" PVC pipe in the outlet control structure to allow for 24 hour drain-down time. See Appendix C for water quality calculations.

3.2 ONE-YEAR CHANNEL PROTECTION ANALYSIS (Sec. 109-144.b)

Channel protection requirements are met by controlling the peak discharge rate to less than 2.0 CFS, for the 1-year, 24-hour rainfall event, at each individual discharge location. The discharge from the stormwater management facility is less than 2 CFS for the 1-year storm event, thus the Dawson County code requirements are met. A 1.5' weir will be formed into the outlet control structure at an invert elevation of 1415.9 and route the 2-100 year storm events.

3.3 OVERBANK AND EXTREME FLOODING PROTECTION (Sec. 109-144.c)

The pond and outlet control structure have been designed to limit the post-developed peak discharge rate to below the post-developed rate for the 1-year through 25-year storm events in accordance with Dawson County requirements. Further, the pond has been designed to safely handle the 100-year 24-hour storm event and safely convey downstream. See summary tables below. The 100-year, 24-hour elevation is calculated to remain within the limits of the proposed detention pond with 1.0 foot of freeboard. The outfall pipe was sized to convey 125% of the 100-year flow. An emergency spillway has been provided should the OCS become clogged. See tables for summary data and Appendix B for Hydraflow Hydrographs input/output.

See tables below for summary flows. For complete reports, see the Autodesk Hydraflow Hydrographs output in Appendices B and C for existing and developed conditions, respectively.

FLOW SUMMARY AT STUDY POINT 1			
STORM EVENT	PRE-DEVELOPED (CFS)	POST-DEVELOPED (CFS)	FLOW CHANGE (CFS)
1	4.63	4.36	-0.27
2	8.16	6.95	-1.21
5	12.10	9.78	-2.32
10	16.36	12.78	-3.58
25	22.44	21.86	-0.58
100	32.21	45.65	13.44

Table 1 – Pre/Post flow summary at Study Point 1

FLOW SUMMARY AT STUDY LINE 2*			
STORM EVENT	PRE-DEVELOPED (CFS)	POST-DEVELOPED (CFS)	FLOW CHANGE (CFS)
1	5.60	1.50	-4.10
2	8.67	2.23	-6.44
5	11.98	3.01	-8.97
10	15.47	3.83	-11.64
25	20.38	4.95	-15.43
100	28.02	6.67	-21.35

Table 2 – Pre/Post flow summary at Study Point 2

**There is no proposed detention pond for Study Point #2. Therefore, the post-developed flows are un-routed.*

FLOW SUMMARY AT STUDY LINE 3*			
STORM EVENT	PRE-DEVELOPED (CFS)	POST-DEVELOPED (CFS)**	FLOW CHANGE (CFS)
1	0.04	-	-0.04
2	0.11	-	-0.11
5	0.19	-	-0.19
10	0.29	-	-0.29
25	0.43	-	-0.43
100	0.66	-	-0.66

Table 2 – Pre/Post flow summary at Study Line 3

**There is no proposed detention pond for Study Point #2. Therefore, the post-developed flows are un-routed.*

***Basin C area included in Post-Developed Basin A1 area for post-developed condition due to re-grading.*

DETENTION POND SUMMARY TABLE				
STORM EVENT	PEAK INFLOW (CFS)	PEAK OUT-FLOW (CFS)	PONDING ELE-VATION (FT MSL)	FREEBOARD* (FT)
1	10.35	0.33	1415.96	4.04
2	15.21	1.59	1416.32	3.68
5	20.41	5.39	1416.92	3.08
10	25.82	10.70	1417.53	2.47
25	33.23	18.30	1418.26	1.74
100	44.62	36.92	1418.89	1.11

Table 3 – Detention Pond Flow and Elevation Summary Table

**Freeboard measured from top of pond overflow point of 1420.00*

DETENTION POND STATGE/STORAGE TABLE	
Elevation (FT, MSL)	Volume (CF)
1411	0
1412	2,600
1413	3,350
1414	3,950
1415	4,550
1416	5,200
1417	5,800
1418	6,520
1419	7,200
1420	7,950

Table 4 – Detention Pond Stage/Storage Summary

3.4 DOWNSTREAM (10%) ANALYSIS (Sec. 109-143.C.F)

A downstream analysis has been performed to determine if there are any adverse impacts in terms of peak flow rate increase or downstream flooding resulting from the proposed improvements. Stormwater runoff from the site drains to a culvert located on the southwestern portion of the subject site. Runoff is then discharged into a tributary of Burt Creek located to the west of Veterans Memorial Park. 10% Drainage Area Maps are included in Appendix A.

The results of the downstream hydraulic/hydrologic analysis indicate that the post-developed condition peak flow rate at the 10% Point of Analysis are less than the pre-developed condition peak flow in the 50- and 100 year, 24-hour design storm events. No adverse impacts are expected downstream. See below for summary data and Appendix B for Hydraflow Hydrographs input/output data.

FLOW SUMMARY AT THE DOWNSTREAM STUDY POINT			
STORM EVENT	PRE-DEVELOPED (CFS)	POST-DEVELOPED (CFS)	FLOW CHANGE (CFS)
1	35.61	31.06	-4.55
2	82.28	73.68	-8.60
5	142.23	132.28	-9.95
10	210.92	202.14	-8.78
25	312.93	305.49	-7.44
100	481.06	480.49	-0.57

Table 5 – Pre/Post flow summary at the Downstream Study Point

3.5 STORM DRAINAGE DESIGN

The proposed storm drainage network was designed to convey the 25-year storm to the proposed stormwater management facility in accordance with Dawson County regulations. A pipe chart and storm drainage area map can be seen in Appendix A.

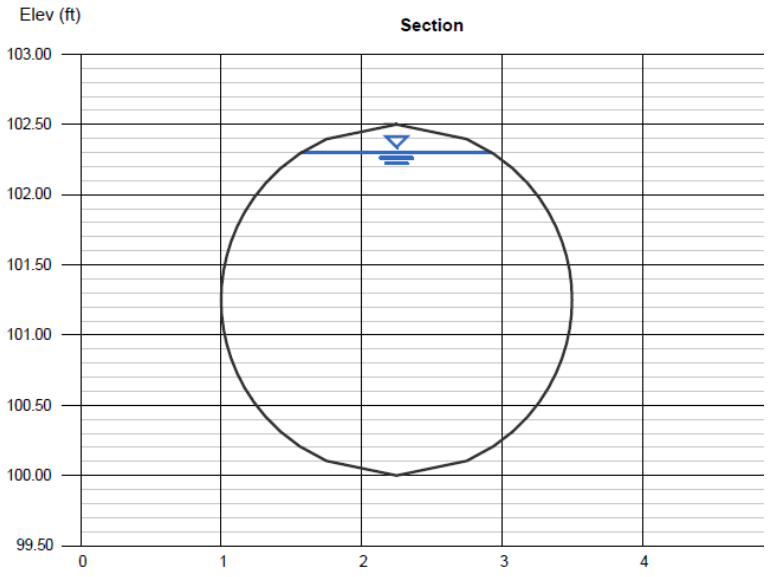
In addition, the outfall pipe was analyzed to confirm capacity for 125% of the 100-year storm. The pipe is adequately sized to handle the proposed flows, a calculation is provided below that depicts that the HGL resulting from a peack flow of 125% of the 100 year flow is contained within the structure.

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 18 2019

125% of 100-yr for OCS outfall

Circular		**Highlighted**	
Diameter (ft)	= 2.50	Depth (ft)	= 2.30
		Q (cfs)	= 46.15
		Area (sqft)	= 4.73
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 9.76
Slope (%)	= 1.10	Wetted Perim (ft)	= 6.43
N-Value	= 0.013	Crit Depth, Yc (ft)	= 2.25
		Top Width (ft)	= 1.35
Calculations		EGL (ft)	= 3.78
Compute by:	Known Q		
Known Q (cfs)	= 46.15		



4 STORMWATER BMP MAINTENANCE PLAN

Structural Storm water best management practices do require regular maintenance in order to function as designed. Maintenance requirements vary based on the intensity of use, choice of construction materials, and environmental conditions such as weather, soil texture, and vegetation.

In order to make sure that the practices are functioning as designed, and to determine when repairs and other maintenance are needed, measures should periodically be inspected by a Licensed Civil Engineer with a copy of this report. The appendix of this report includes inspection forms that should be used for each different structural measure. These forms should be filled out, dated, and maintained by the property owner.

The owner of the on which the Best Management Practices reside will be responsible for the regular inspection and maintenance of structural best management practices.

5 CONCLUSION

In Conclusion:

- The proposed stormwater management facility has been designed using the guidelines in the Dawson County Code of Ordinances.
- Detention is provided for this development within the limits of a graded detention pond located on the southwestern portion of the subject site
- This pond is also designed to provide water quality and channel protection for the areas draining through the pond

Therefore, the proposed design will satisfy the stormwater management requirements set forth by Dawson County. Additional information including supporting calculations can be found in the Appendices to this report.

Appendix A

PRE-DEVELOPED DRAINAGE BASIN MAP

PRE-DEVELOPED BASIN A
AREA = 6.13 AC.
CN = 64
Tc = 12.4 MIN

PRE-DEVELOPED BASIN C (BYPASS)
AREA = 0.13 AC.
CN = 55
Tc = 5 MIN

STUDY LINE #3

NAD83 - GA STATE PLANE WEST ZONE

N

1" = 80'

100' 50' 0 100' 200'

SCALE IN FEET

STUDY POINT #1

PRE-DEVELOPED BASIN B
AREA = 4.18 AC.
CN = 70
Tc = 10.8 MIN

STUDY LINE #2

EXISTING SENIOR CENTER BUILDING

RECREATION RD

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POST-DEVELOPED DRAINAGE BASIN MAP

POST-DEVELOPED BASIN A2
(BYPASS)
AREA = 3.1 AC.
CN = 67
Tc = 5.0 MIN

POST-DEVELOPED BASIN A1
(TO POND)
AREA = 6.55 AC.
CN = 74
Tc = 12.1 MIN

1" = 80'

80 40 0 80 160

SCALE IN FEET

NAD83 - GA STATE PLANE WEST ZONE

N

TIME OF CONCENTRATION PATH, TYP.

STUDY POINT #1

PROPOSED OCS

PROPOSED DETENTION POND

POST-DEVELOPED BASIN B
AREA = 0.79 AC.
CN = 72
Tc = 5.0 MIN

STUDY LINE #2

PROPOSED SENIOR CENTER BUILDING

RECREATION RD

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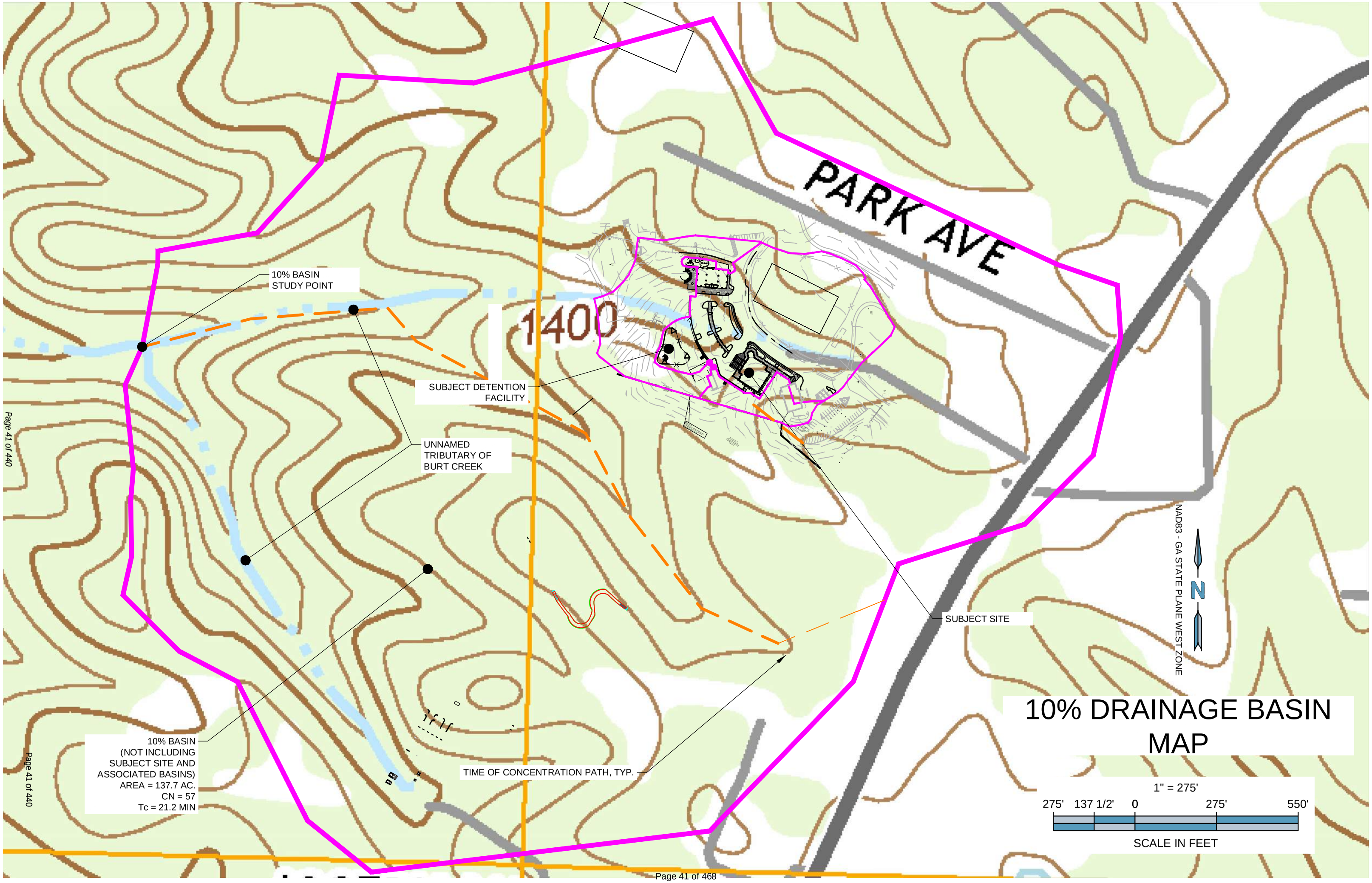

10% DRAINAGE BASIN MAP

STORM DRAINAGE MAP

N

1" = 80'

80 40 0 80 160

SCALE IN FEET

INLET 210
AREA = 0.35 AC
C = 0.78

INLET 402
AREA = 0.23 AC
C = 0.2

INLET 208
AREA = 0.72 AC
C = 0.80

INLET 212
AREA = 1.64 AC
C =0.34

INLET 214
AREA = 2.64 AC
C = 0.37

OUTFALL
Q (25 YR) =17.84 CFS

INLET 302
AREA = 0.46
C = 0.81

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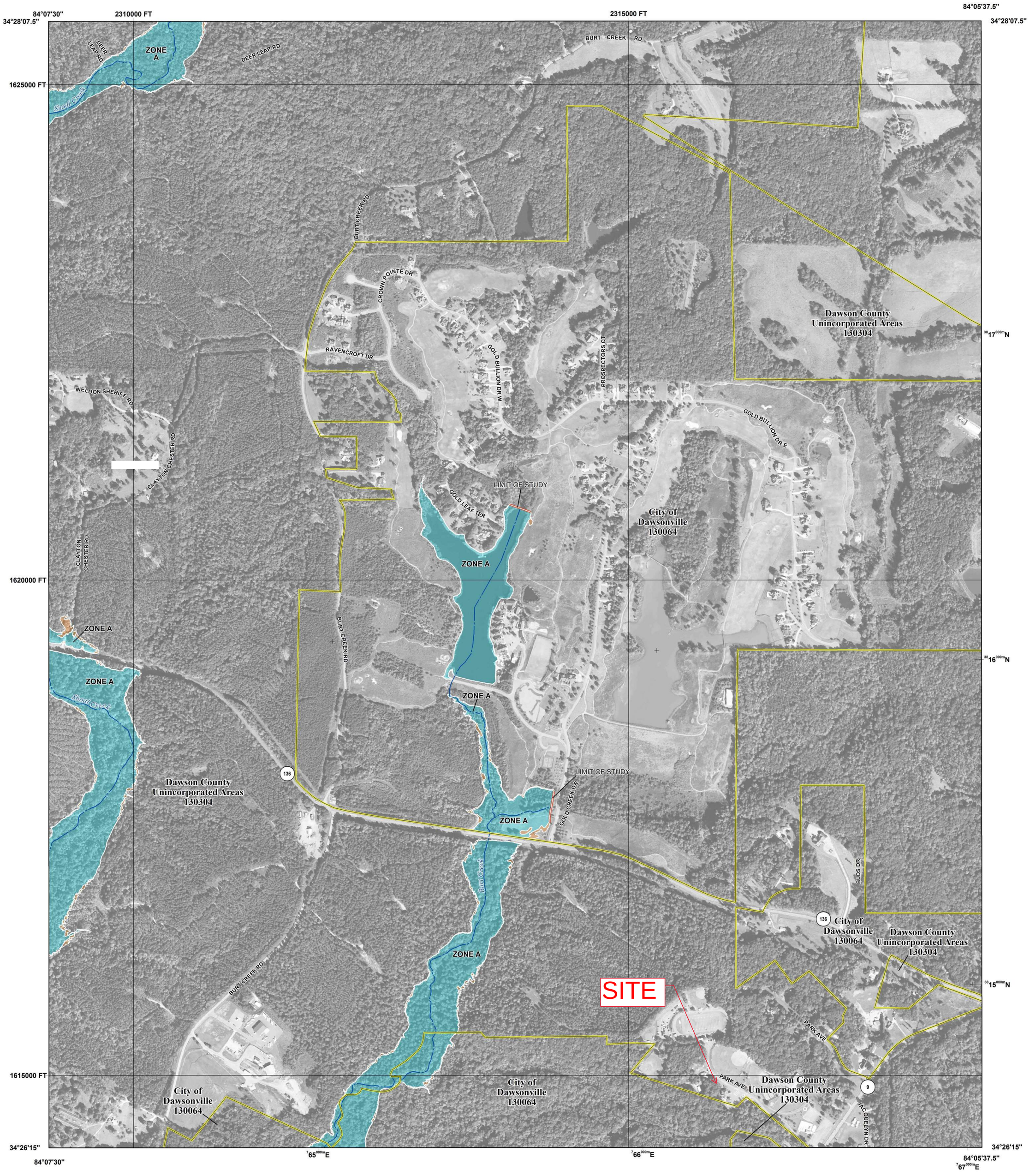


FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by the National Agriculture Imagery Program (NAIP). This information was derived from digital orthoimagery dated 2013 at a 1-meter resolution.

SCALE

N

Map Projection:
State Plane Transverse Mercator, Georgia West Zone (FIPS Zone 1002);
North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR

* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

DAWSON COUNTY, GEORGIA
and Incorporated Areas

PANEL 103 OF 250

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
DAWSON COUNTY	130304	0103	C
DAWSONVILLE, CITY OF	130064	0103	C

VERSION NUMBER
2.3.3.2

MAP NUMBER
13085C0103C

MAP REVISED
APRIL 4, 2018

Soil Map

Map Scale: 1:1,810 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dawson, Lumpkin, and White Counties, Georgia
Survey Area Data: Version 13, Oct 9, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 20, 2015—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cac	Cartecay complex, 0 to 2 percent slopes, frequently flooded	2.0	11.6%
FaC	Fannin fine sandy loam, 6 to 10 percent slopes	0.4	2.5%
FaE	Fannin fine sandy loam, 10 to 25 percent slopes	10.3	58.9%
HIE	Hayesville sandy loam, 10 to 25 percent slopes	4.7	26.9%
TdG	Tallapoosa soils, 25 to 70 percent slopes	0.0	0.2%
Totals for Area of Interest		**17.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Dawson, Lumpkin, and White Counties, Georgia

Cac—Cartecay complex, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2tx4b
Elevation: 450 to 1,100 feet
Mean annual precipitation: 44 to 60 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 190 to 230 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cartecay, frequently flooded, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cartecay, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

Ap - 0 to 9 inches: fine sandy loam
C - 9 to 40 inches: sandy loam
Cg - 40 to 80 inches: sandy loam, loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Wehadkee, frequently flooded

Percent of map unit: 5 percent
Landform: Backswamps on flood plains, depressions on flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread

Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

FaC—Fannin fine sandy loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 46rf
Mean annual precipitation: 52 to 68 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fannin and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fannin

Setting

Landform: Mountains
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from gneiss and/or residuum weathered from mica schist

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 32 inches: sandy clay loam
H3 - 32 to 60 inches: fine sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

FaE—Fannin fine sandy loam, 10 to 25 percent slopes

Map Unit Setting

National map unit symbol: 46rg
Mean annual precipitation: 52 to 68 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Fannin and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fannin

Setting

Landform: Mountains
Landform position (three-dimensional): Mountainflank, mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from mica schist

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 32 inches: sandy clay loam
H3 - 32 to 60 inches: fine sandy loam

Properties and qualities

Slope: 10 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

HIE—Hayesville sandy loam, 10 to 25 percent slopes

Map Unit Setting

National map unit symbol: 46rp
Mean annual precipitation: 52 to 68 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Hayesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hayesville

Setting

Landform: Mountains
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss and/or residuum weathered from schist

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 38 inches: clay loam
H3 - 38 to 48 inches: sandy clay loam
H4 - 48 to 60 inches: loam

Properties and qualities

Slope: 10 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

TdG—Tallapoosa soils, 25 to 70 percent slopes

Map Unit Setting

National map unit symbol: 46sg
Elevation: 800 to 1,800 feet
Mean annual precipitation: 44 to 60 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 190 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Tallapoosa and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tallapoosa

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from mica schist and/or residuum weathered from gneiss

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 10 inches: loam
H3 - 10 to 19 inches: loam
Cr - 19 to 60 inches: weathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

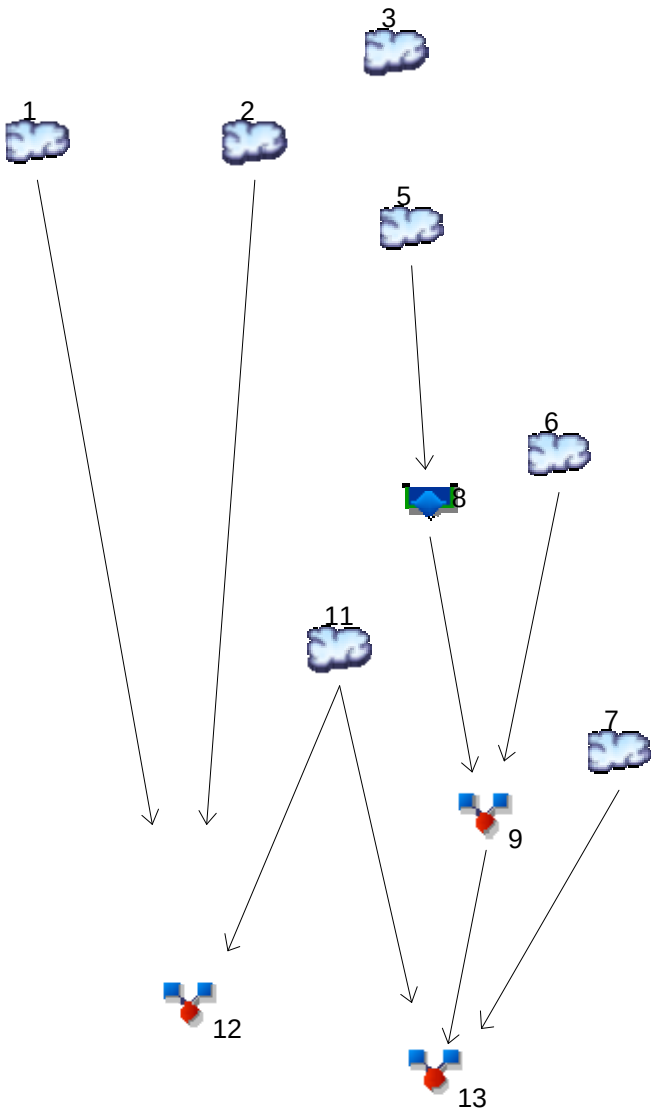
Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Appendix B

Hydraflow Table of Contents

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Developed Basin A
2	SCS Runoff	Pre-Developed Basin B
3	SCS Runoff	Pre-Developed Basin C (Bypass)
5	SCS Runoff	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	Post-Developed Basin B
8	Reservoir	Detention Pond
9	Combine	Post-Developed Basin A (Combined)
11	SCS Runoff	10% Basin
12	Combine	Existing 10% Basin
13	Combine	Post-Developed 10% Basin

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	4.634	8.155	-------	12.10	16.36	22.44	27.26	32.21	Pre-Developed Basin A
2	SCS Runoff	------	5.604	8.667	-------	11.98	15.47	20.38	24.17	28.02	Pre-Developed Basin B
3	SCS Runoff	------	0.040	0.107	-------	0.189	0.285	0.426	0.539	0.658	Pre-Developed Basin C (Bypass)
5	SCS Runoff	------	10.35	15.21	-------	20.41	25.82	33.23	38.90	44.62	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	------	4.214	6.774	-------	9.579	12.56	16.73	19.96	23.26	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	------	1.497	2.230	-------	3.011	3.826	4.947	5.804	6.670	Post-Developed Basin B
8	Reservoir	5	0.325	1.586	-------	5.385	10.70	18.30	26.57	36.92	Detention Pond
9	Combine	6, 8	4.355	6.945	-------	9.775	12.78	21.86	30.64	44.65	Post-Developed Basin A (Combined)
11	SCS Runoff	------	29.90	71.97	-------	126.53	189.68	283.52	359.18	438.50	10% Basin
12	Combine	1, 2, 11	35.61	82.28	-------	142.23	210.92	312.93	395.06	481.06	Existing 10% Basin
13	Combine	7, 9, 11,	31.06	73.68	-------	132.28	202.14	305.49	390.56	480.49	Post-Developed 10% Basin

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.634	1	722	13,921	------	------	------	Pre-Developed Basin A
2	SCS Runoff	5.604	1	721	14,252	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.040	1	720	146	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	10.35	1	722	26,782	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	4.214	1	718	8,966	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	1.497	1	718	3,047	------	------	------	Post-Developed Basin B
8	Reservoir	0.325	1	963	25,568	5	1415.96	16,850	Detention Pond
9	Combine	4.355	1	718	34,534	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	29.90	1	730	184,084	------	------	------	10% Basin
12	Combine	35.61	1	728	212,256	1, 2, 11	------	------	Existing 10% Basin
13	Combine	31.06	1	730	221,665	7, 9, 11,	------	------	Post-Developed 10% Basin

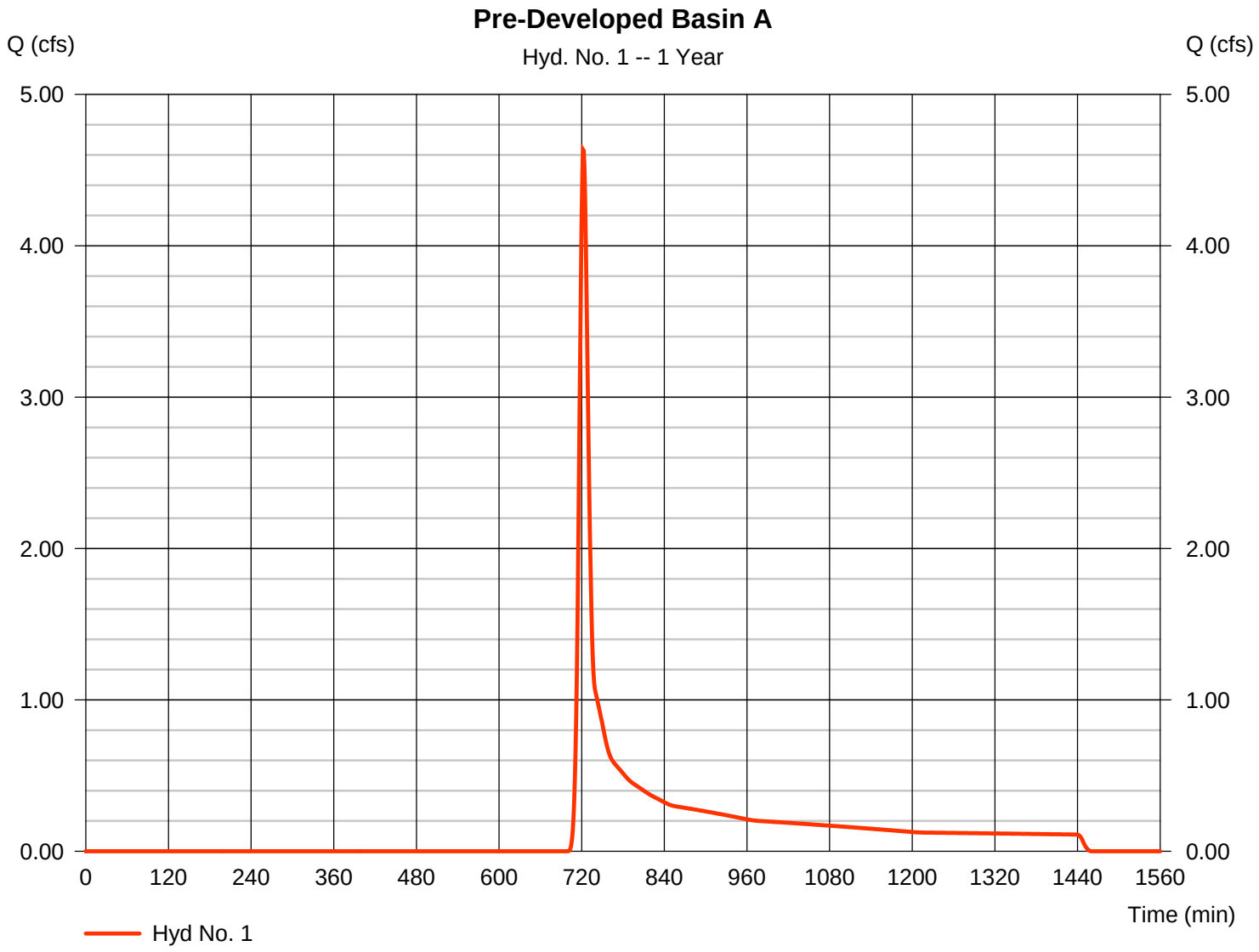
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	= SCS Runoff	Peak discharge	= 4.634 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 13,921 cuft
Drainage area	= 6.130 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.40 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



TR55 Tc Worksheet

Hyd. No. 1

Pre-Developed Basin A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.08		0.00		0.00		
Land slope (%)	= 1.90		0.00		0.00		
Travel Time (min)	**= 8.86**	**+**	**0.00**	**+**	**0.00**	**=**	**8.86**
Shallow Concentrated Flow							
Flow length (ft)	= 225.00		70.00		0.00		
Watercourse slope (%)	= 2.90		16.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=2.75		6.45		0.00		
Travel Time (min)	**= 1.36**	**+**	**0.18**	**+**	**0.00**	**=**	**1.55**
Channel Flow							
X sectional flow area (sqft)	= 1.77		4.50		0.00		
Wetted perimeter (ft)	= 4.70		9.00		0.00		
Channel slope (%)	= 4.20		8.90		0.00		
Manning's n-value	= 0.024		0.060		0.015		
Velocity (ft/s)	=6.61						
			4.66				
					0.00		
Flow length (ft)	({0})40.0		535.0		0.0		
Travel Time (min)	**= 0.10**	**+**	**1.91**	**+**	**0.00**	**=**	**2.02**

Total Travel Time, Tc ..... 12.40 min

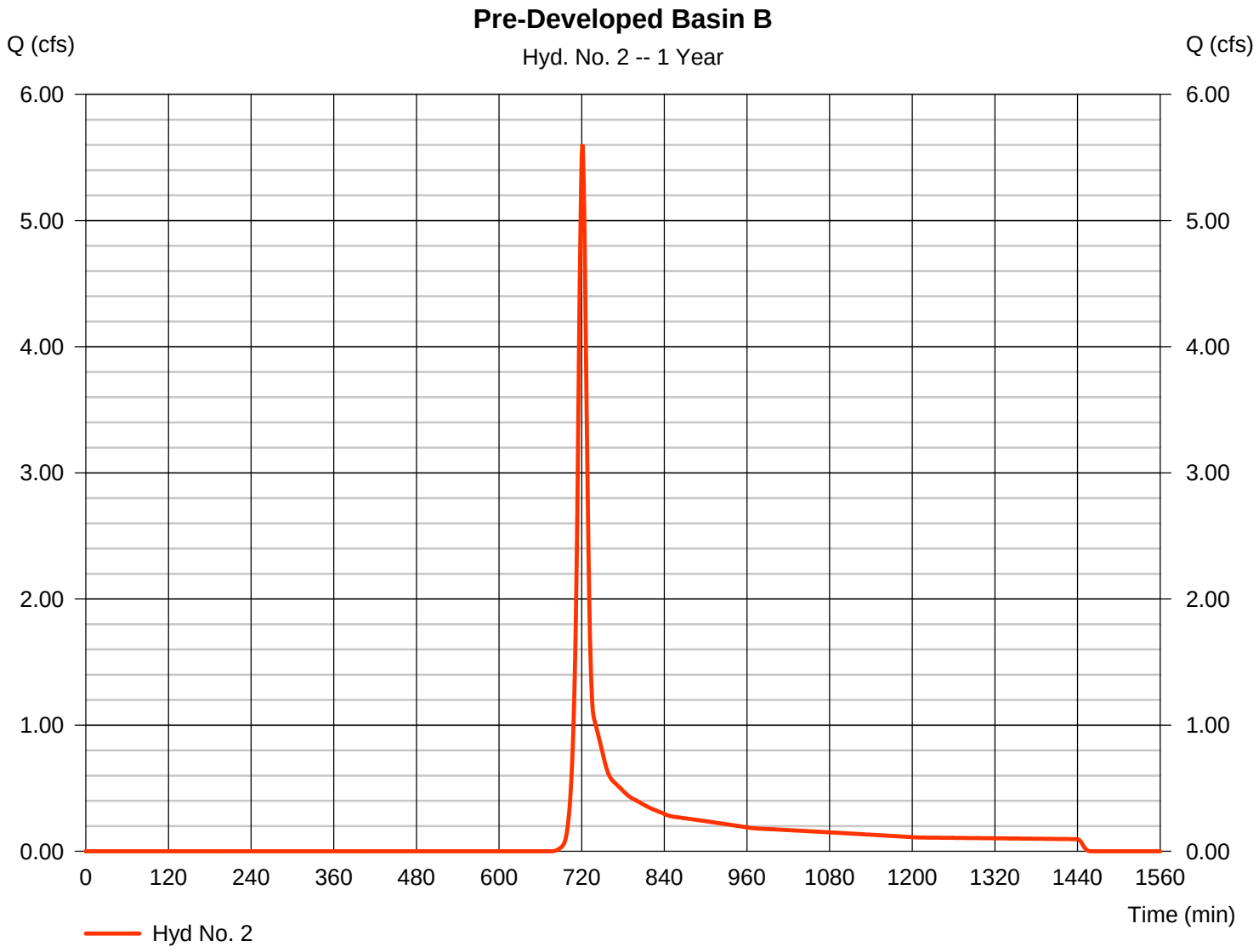
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	= SCS Runoff	Peak discharge	= 5.604 cfs
Storm frequency	= 1 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 14,252 cuft
Drainage area	= 4.180 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.80 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180



TR55 Tc Worksheet

Hyd. No. 2

Pre-Developed Basin B

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.08		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 8.68**	**+**	**0.00**	**+**	**0.00**	**=**	**8.68**
Shallow Concentrated Flow							
Flow length (ft)	= 225.00		70.00		0.00		
Watercourse slope (%)	= 2.50		16.50		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=2.55		6.55		0.00		
Travel Time (min)	**= 1.47**	**+**	**0.18**	**+**	**0.00**	**=**	**1.65**
Channel Flow							
X sectional flow area (sqft)	= 1.22		4.50		0.00		
Wetted perimeter (ft)	= 3.90		9.00		0.00		
Channel slope (%)	= 12.50		11.00		0.00		
Manning's n-value	= 0.024		0.035		0.015		
Velocity (ft/s)	=10.08						
			8.87				
					0.00		
Flow length (ft)	({0})120.0		145.0		0.0		
Travel Time (min)	**= 0.20**	**+**	**0.27**	**+**	**0.00**	**=**	**0.47**

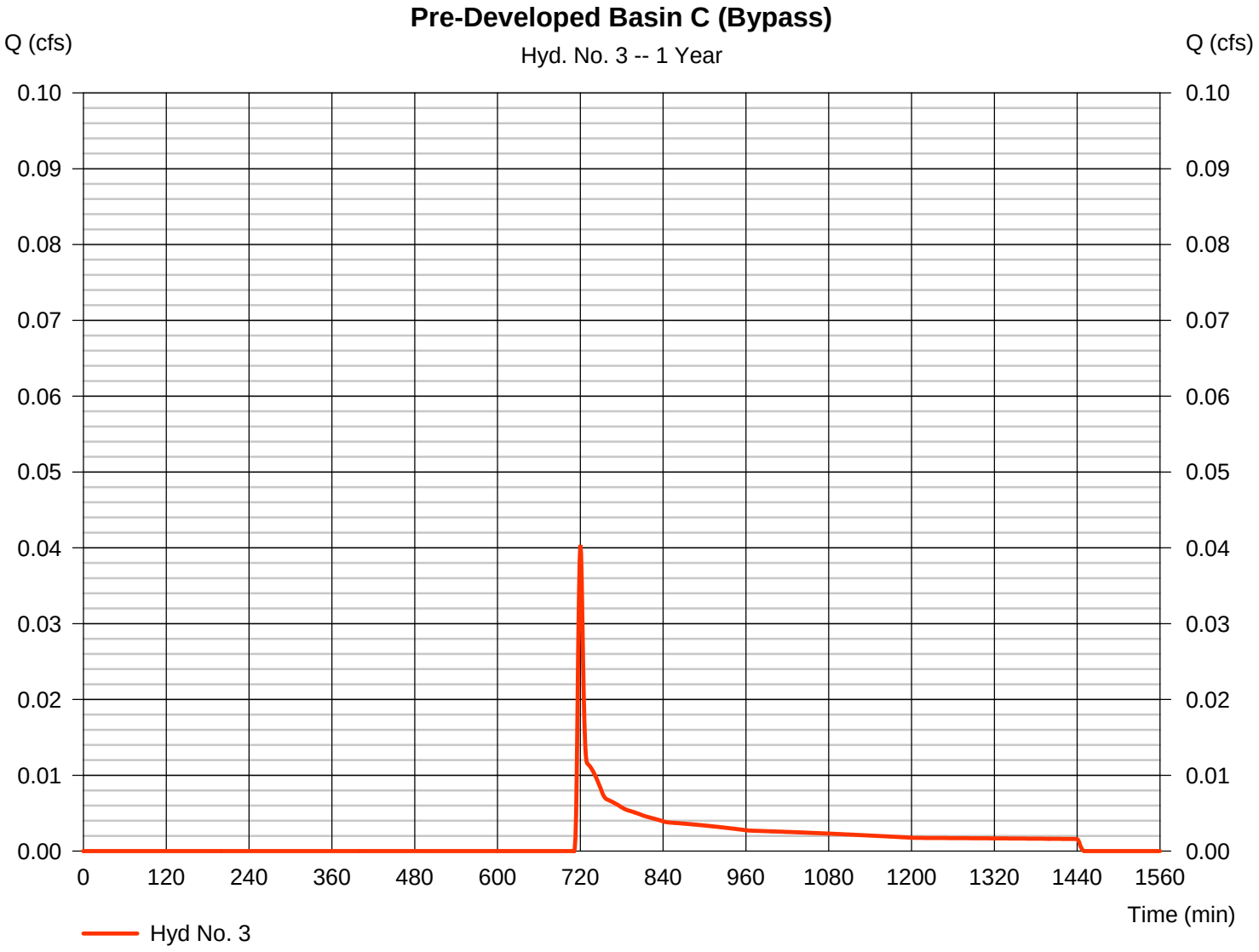
Total Travel Time, Tc ..... 10.80 min

Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.040 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 146 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



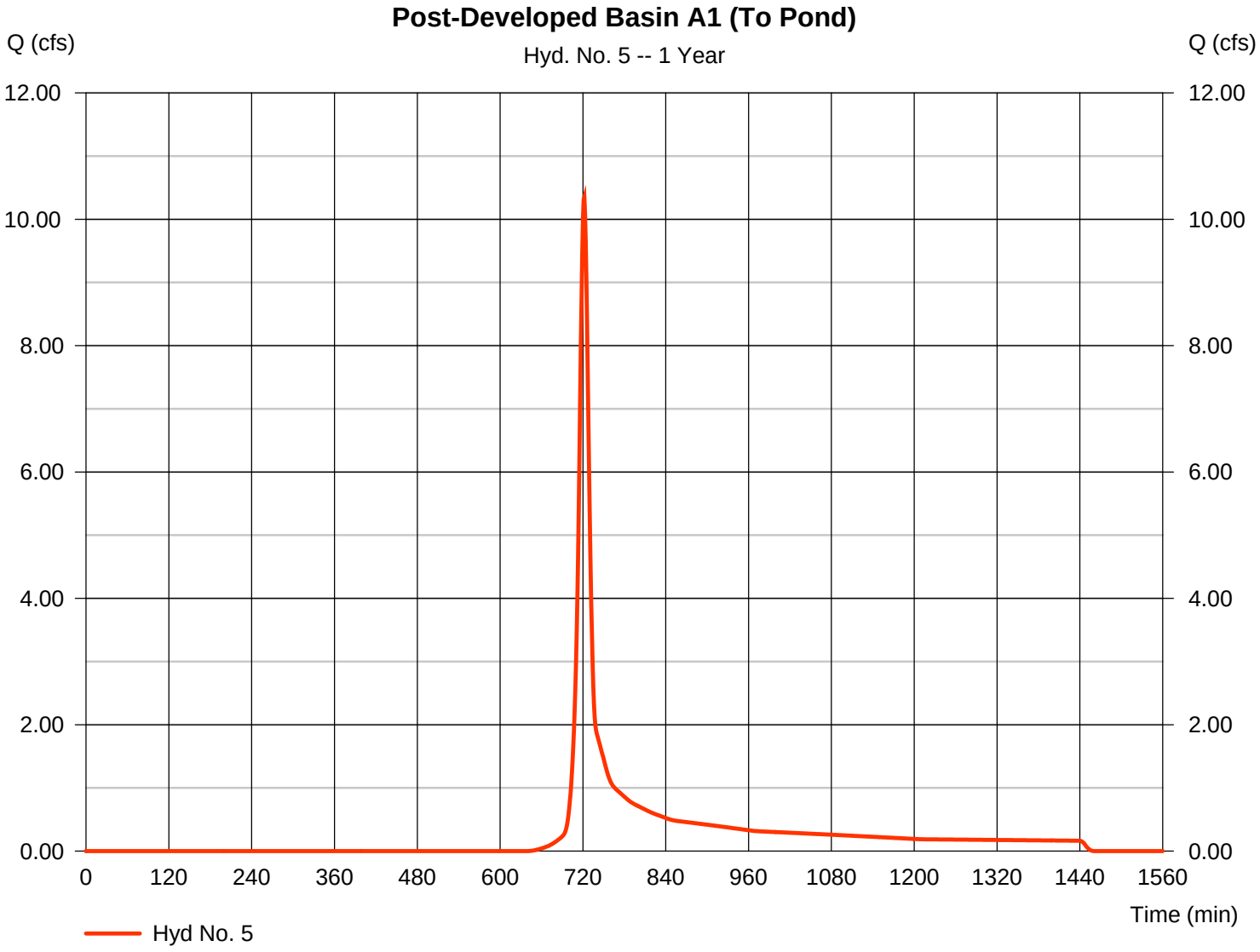
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	= SCS Runoff	Peak discharge	= 10.35 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 26,782 cuft
Drainage area	= 6.550 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



TR55 Tc Worksheet

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.08		0.00		0.00		
Land slope (%)	= 1.50		0.00		0.00		
Travel Time (min)	**= 9.74**	**+**	**0.00**	**+**	**0.00**	**=**	**9.74**
Shallow Concentrated Flow							
Flow length (ft)	= 245.00		0.00		0.00		
Watercourse slope (%)	= 1.50		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=1.98		0.00		0.00		
Travel Time (min)	**= 2.07**	**+**	**0.00**	**+**	**0.00**	**=**	**2.07**
Channel Flow							
X sectional flow area (sqft)	= 3.14		4.90		0.00		
Wetted perimeter (ft)	= 6.28		7.90		0.00		
Channel slope (%)	= 5.30		2.00		0.00		
Manning's n-value	= 0.012		0.012		0.015		
Velocity (ft/s)	=17.97						
			12.75				
					0.00		
Flow length (ft)	({0})250.0		63.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.08**	**+**	**0.00**	**=**	**0.31**

Total Travel Time, Tc ..... 12.10 min

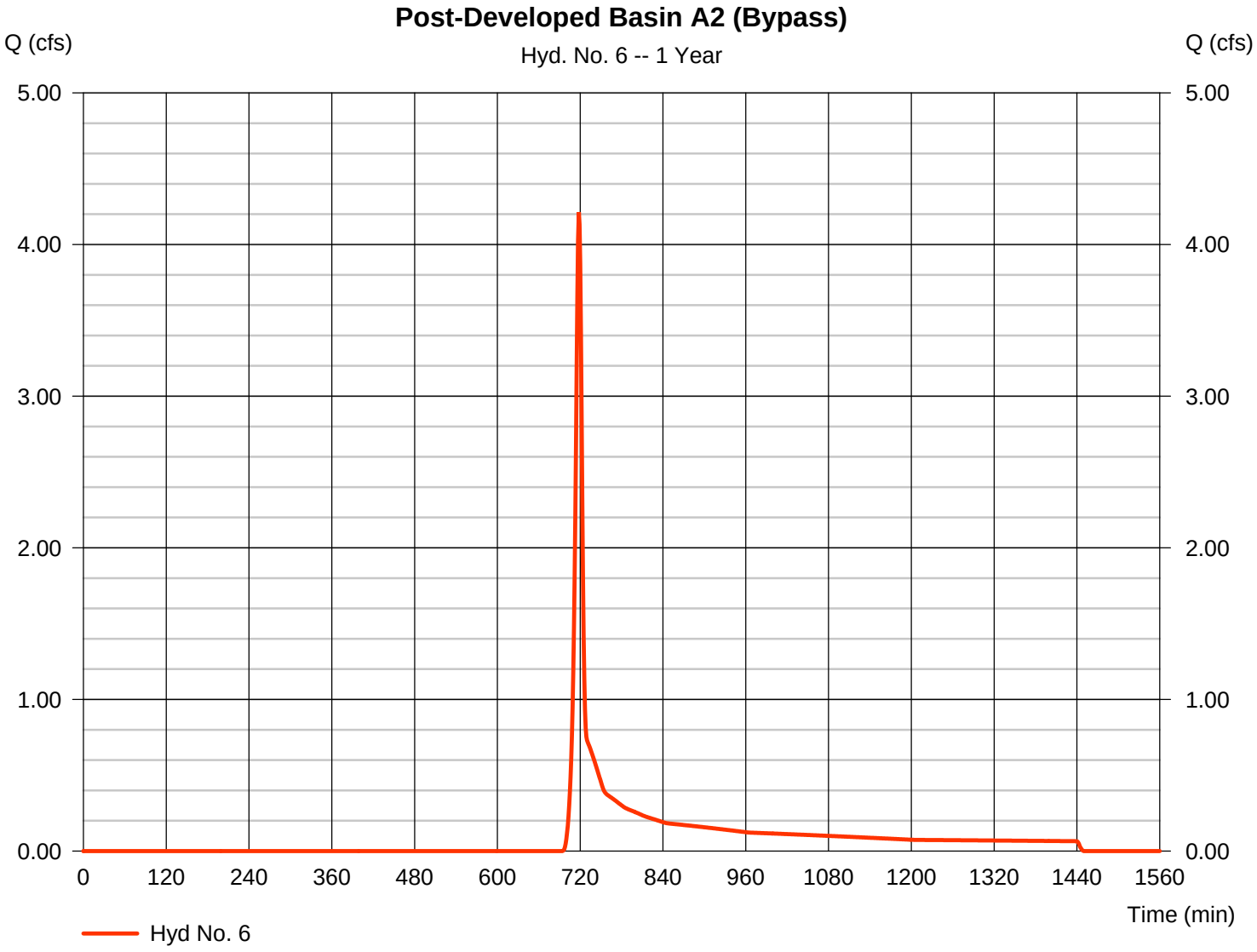
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.214 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 8,966 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



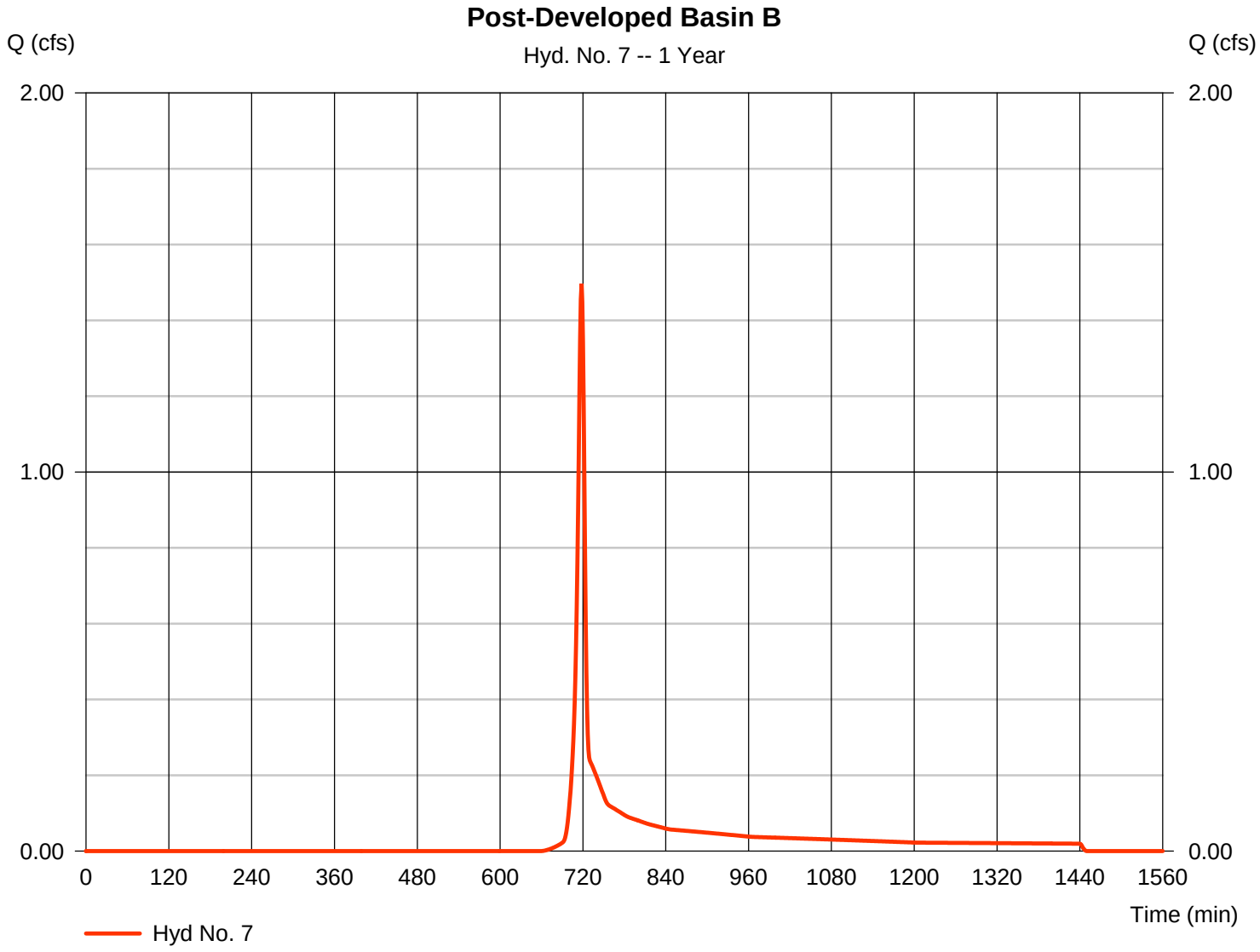
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.497 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	3,047 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	3.36 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



TR55 Tc Worksheet

Hyd. No. 7

Post-Developed Basin B

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.08		0.00		0.00		
Land slope (%)	= 9.00		0.00		0.00		
Travel Time (min)	**= 4.75**	**+**	**0.00**	**+**	**0.00**	**=**	**4.75**
Shallow Concentrated Flow							
Flow length (ft)	= 390.00		0.00		0.00		
Watercourse slope (%)	= 33.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=9.27		0.00		0.00		
Travel Time (min)	**= 0.70**	**+**	**0.00**	**+**	**0.00**	**=**	**0.70**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 5.50 min

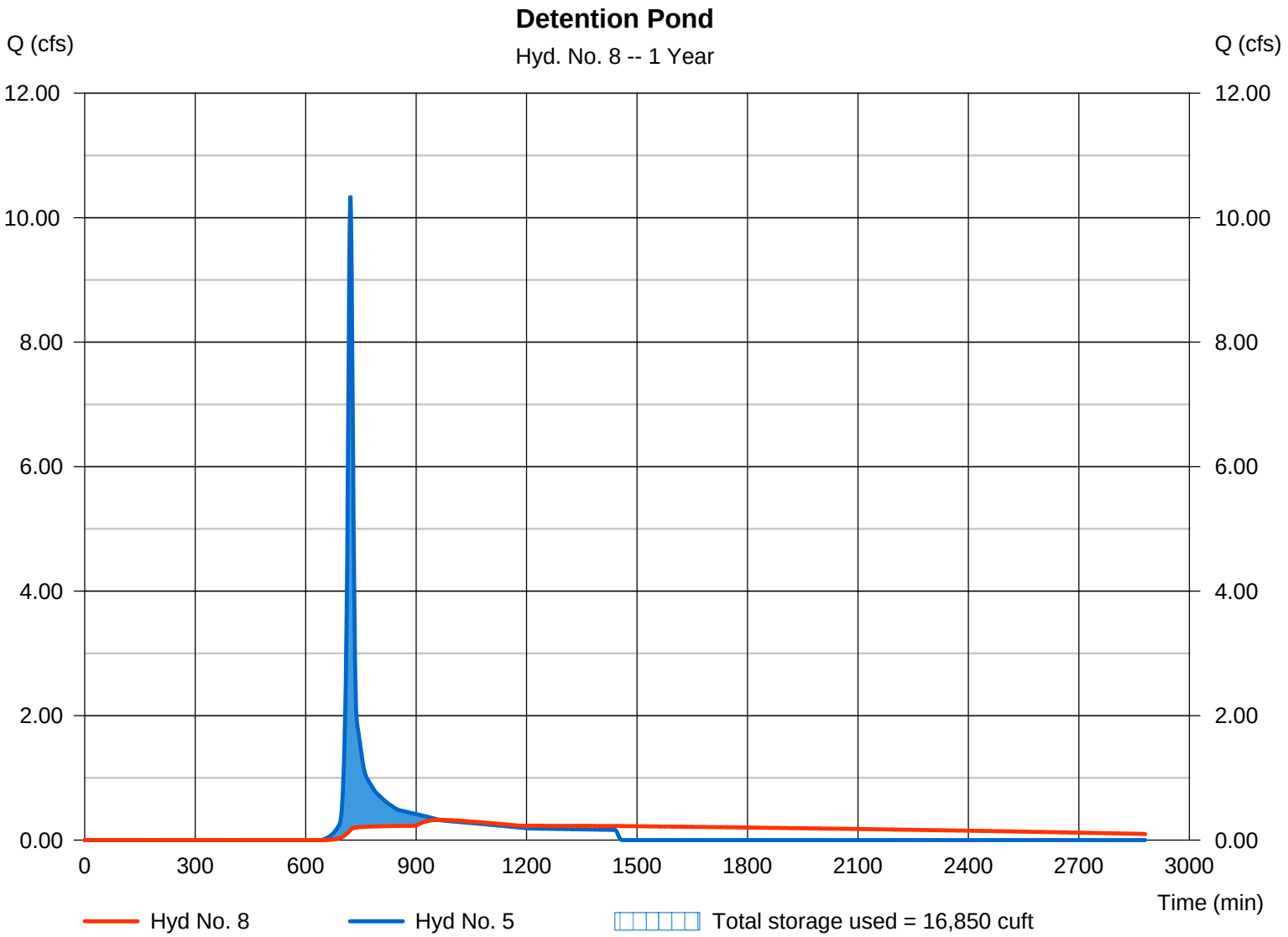
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.325 cfs
Storm frequency	=	1 yrs	Time to peak	=	963 min
Time interval	=	1 min	Hyd. volume	=	25,568 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total)	Max. Elevation	=	1415.96 ft
Reservoir name	=	Detention Pond	Max. Storage	=	16,850 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Detention Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1411.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1411.00	00	0	0
1.00	1412.00	2,600	1,300	1,300
2.00	1413.00	3,350	2,975	4,275
3.00	1414.00	3,950	3,650	7,925
4.00	1415.00	4,550	4,250	12,175
5.00	1416.00	5,200	4,875	17,050
6.00	1417.00	5,800	5,500	22,550
7.00	1418.00	6,520	6,160	28,710
8.00	1419.00	7,200	6,860	35,570
9.00	1420.00	7,950	7,575	43,145

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	2.00	Inactive	0.00
Span (in)	= 30.00	2.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1410.00	1411.00	0.00	0.00
Length (ft)	= 54.35	0.50	0.00	0.00
Slope (%)	= 1.12	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

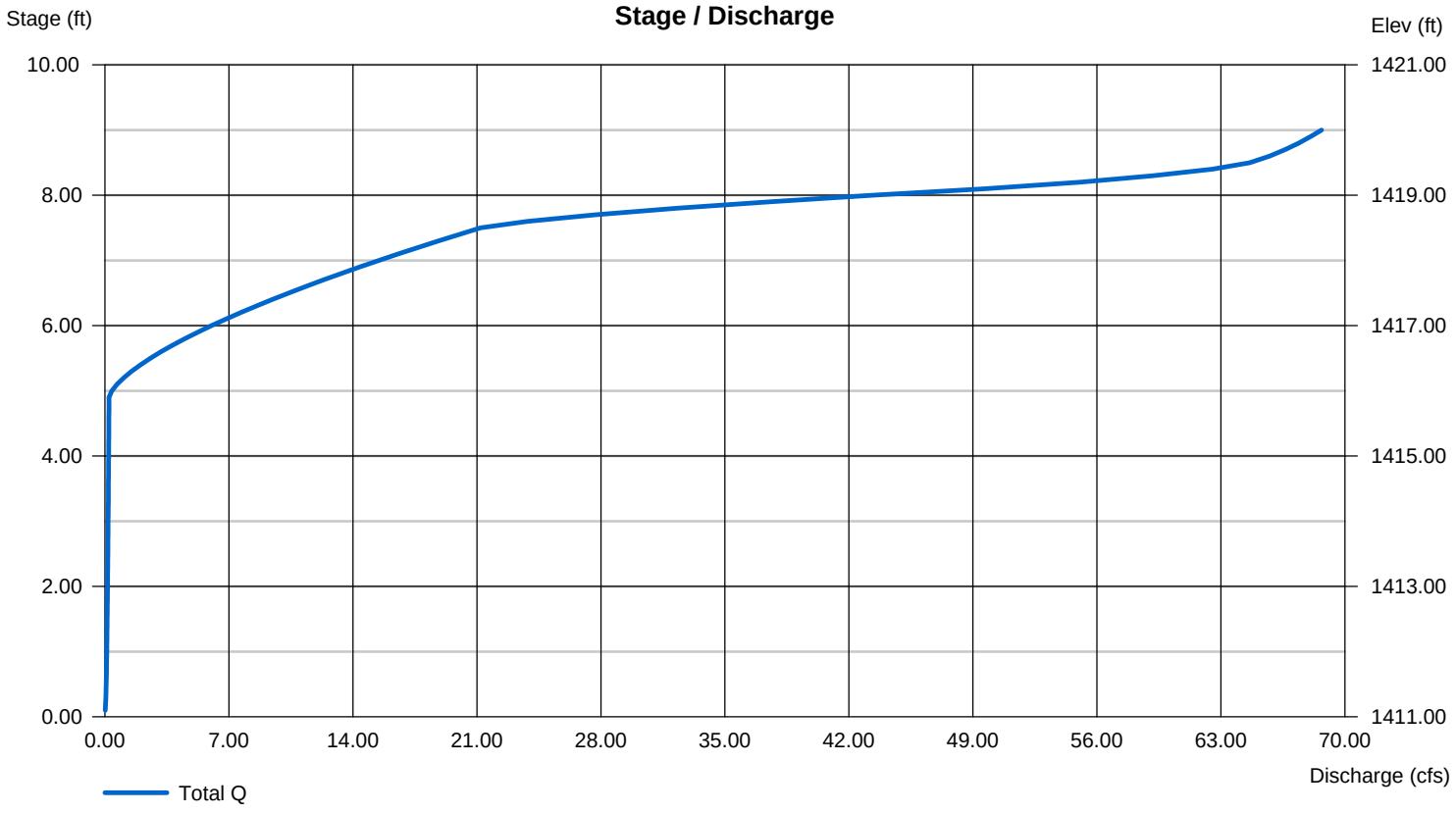
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 13.50	1.50	0.00	0.00
Crest El. (ft)	= 1418.50	1415.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

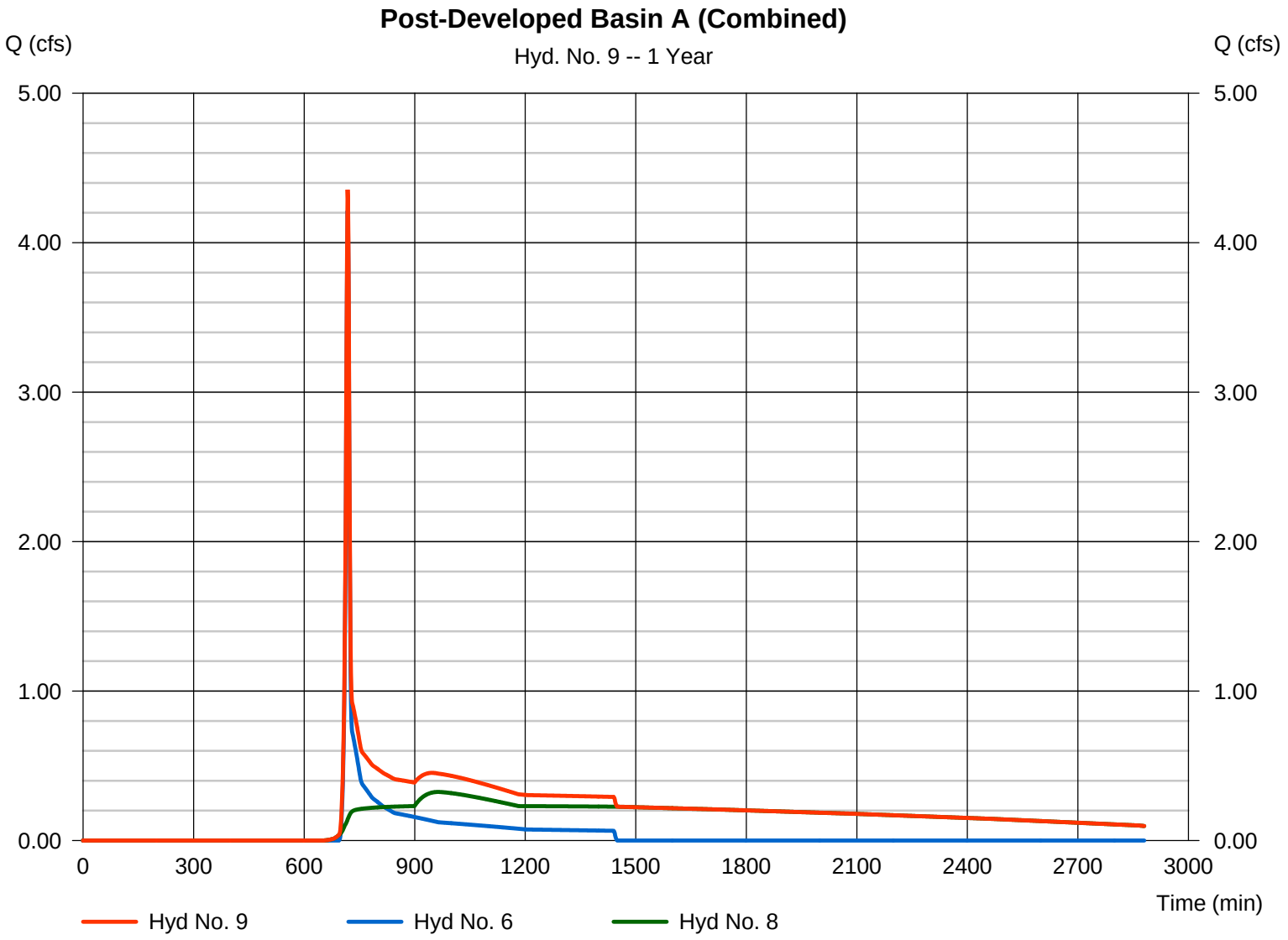


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	= Combine	Peak discharge	= 4.355 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 34,534 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 3.100 ac



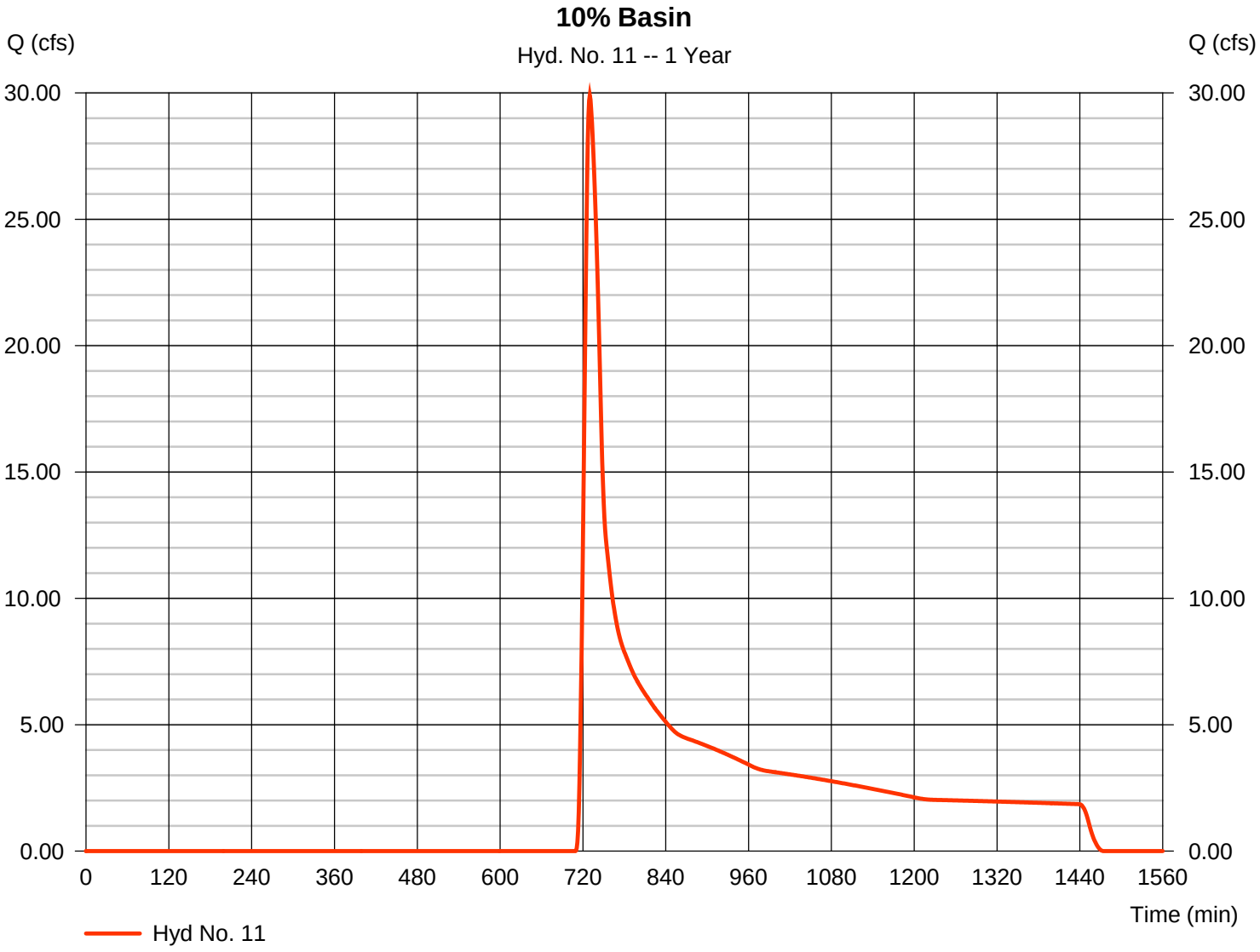
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	29.90 cfs
Storm frequency	=	1 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	184,084 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	3.36 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700



TR55 Tc Worksheet

Hyd. No. 11

10% Basin

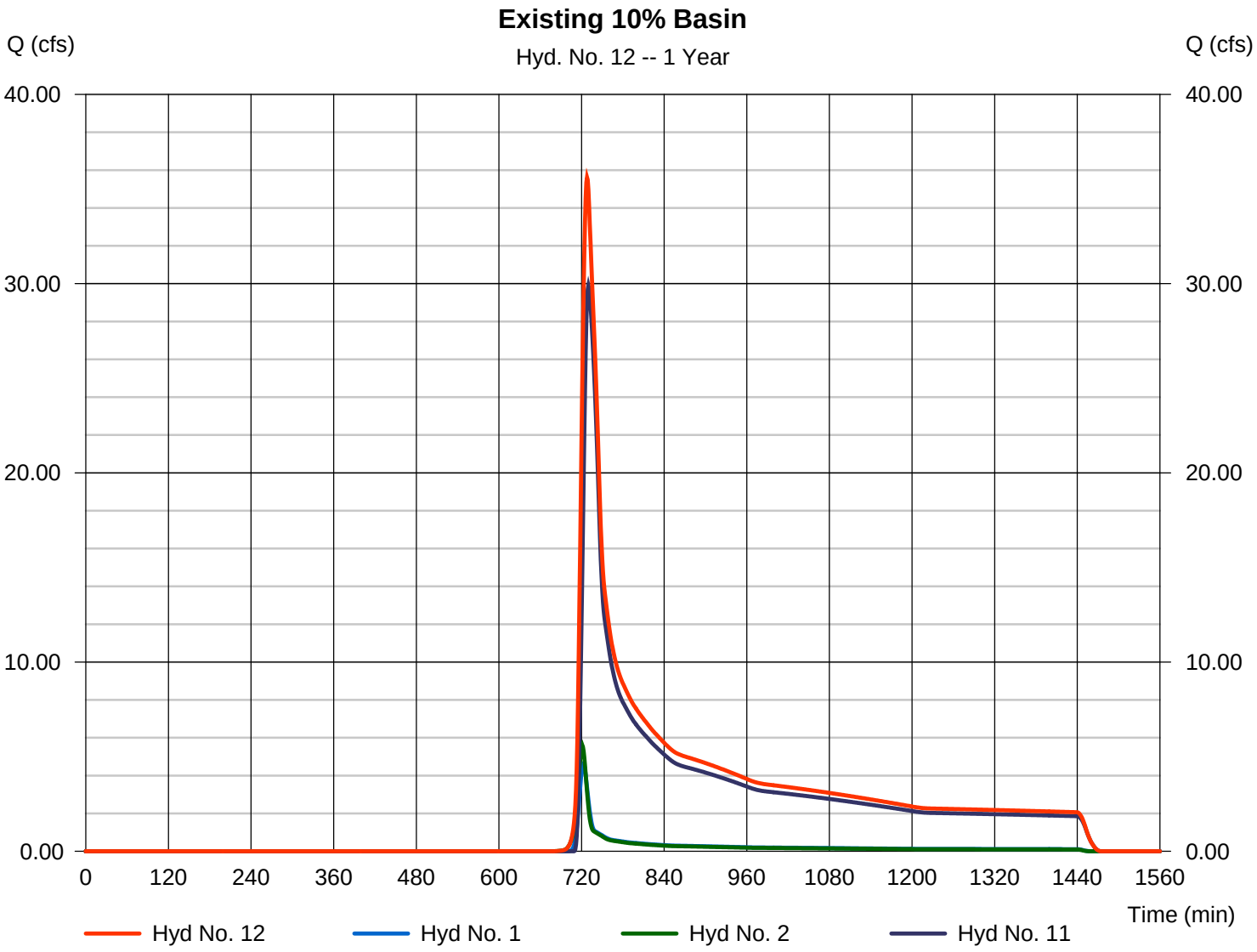
Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.08		0.00		0.00		
Land slope (%)	= 3.00		0.00		0.00		
Travel Time (min)	**= 16.17**	**+**	**0.00**	**+**	**0.00**	**=**	**16.17**
Shallow Concentrated Flow							
Flow length (ft)	= 290.00		0.00		0.00		
Watercourse slope (%)	= 5.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.61		0.00		0.00		
Travel Time (min)	**= 1.34**	**+**	**0.00**	**+**	**0.00**	**=**	**1.34**
Channel Flow							
X sectional flow area (sqft)	= 25.13		0.00		0.00		
Wetted perimeter (ft)	= 12.56		0.00		0.00		
Channel slope (%)	= 3.00		0.00		0.00		
Manning's n-value	= 0.035		0.015		0.015		
Velocity (ft/s)	=11.74						
			0.00				
					0.00		
Flow length (ft)	({0})2630.0		0.0		0.0		
Travel Time (min)	**= 3.74**	**+**	**0.00**	**+**	**0.00**	**=**	**3.74**
Total Travel Time, Tc							**21.20 min**

Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	35.61 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	212,256 cuft
Inflow hyds.	=	1, 2, 11	Contrib. drain. area	=	148.010 ac

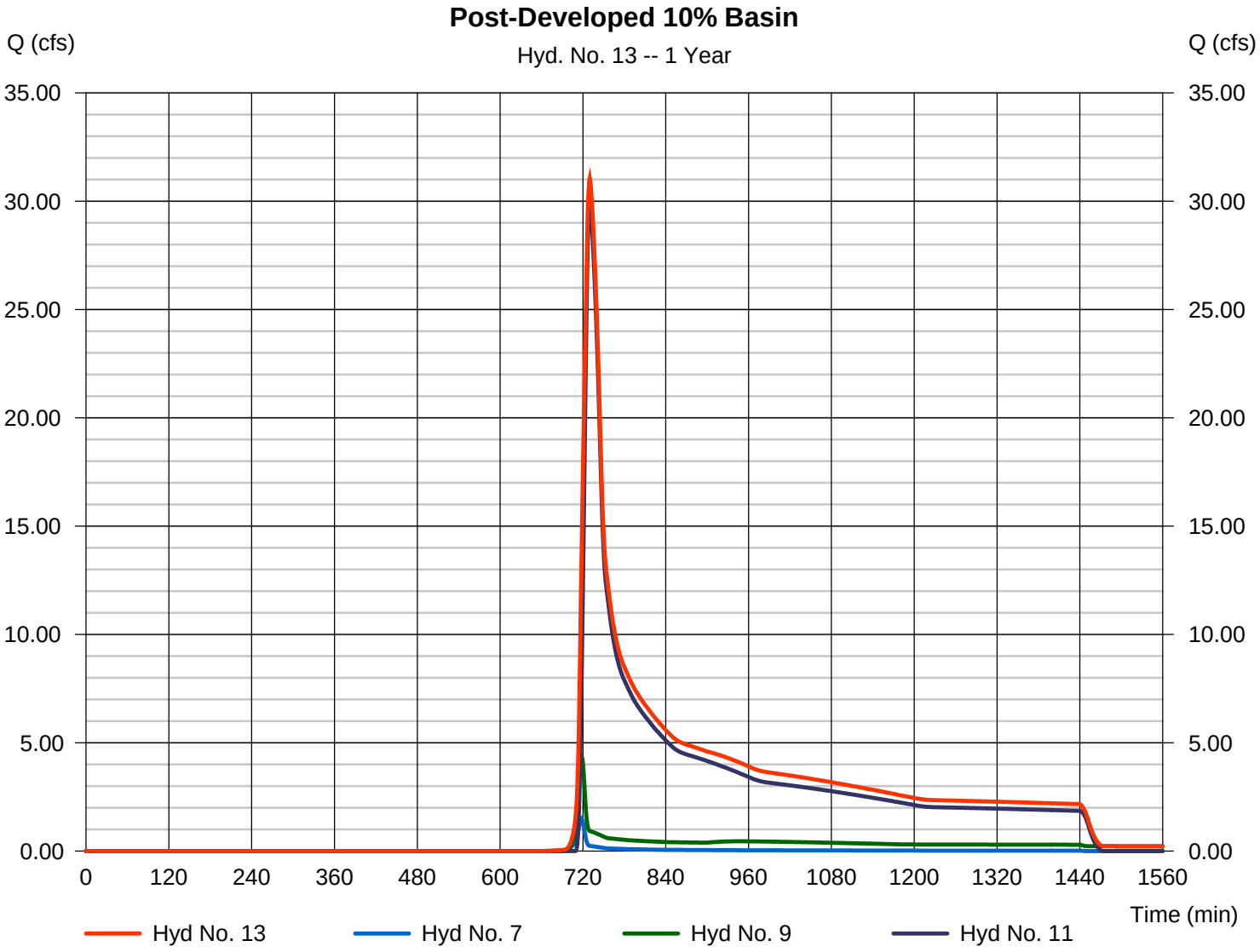


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	31.06 cfs
Storm frequency	=	1 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	221,665 cuft
Inflow hyds.	=	7, 9, 11	Contrib. drain. area	=	138.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.155	1	722	22,292	------	------	------	Pre-Developed Basin A
2	SCS Runoff	8.667	1	721	21,365	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.107	1	719	273	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	15.21	1	721	38,742	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	6.774	1	718	13,859	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	2.230	1	718	4,484	------	------	------	Post-Developed Basin B
8	Reservoir	1.586	1	758	37,171	5	1416.32	18,791	Detention Pond
9	Combine	6.945	1	718	51,030	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	71.97	1	729	329,813	------	------	------	10% Basin
12	Combine	82.28	1	727	373,470	1, 2, 11	------	------	Existing 10% Basin
13	Combine	73.68	1	729	385,328	7, 9, 11,	------	------	Post-Developed 10% Basin

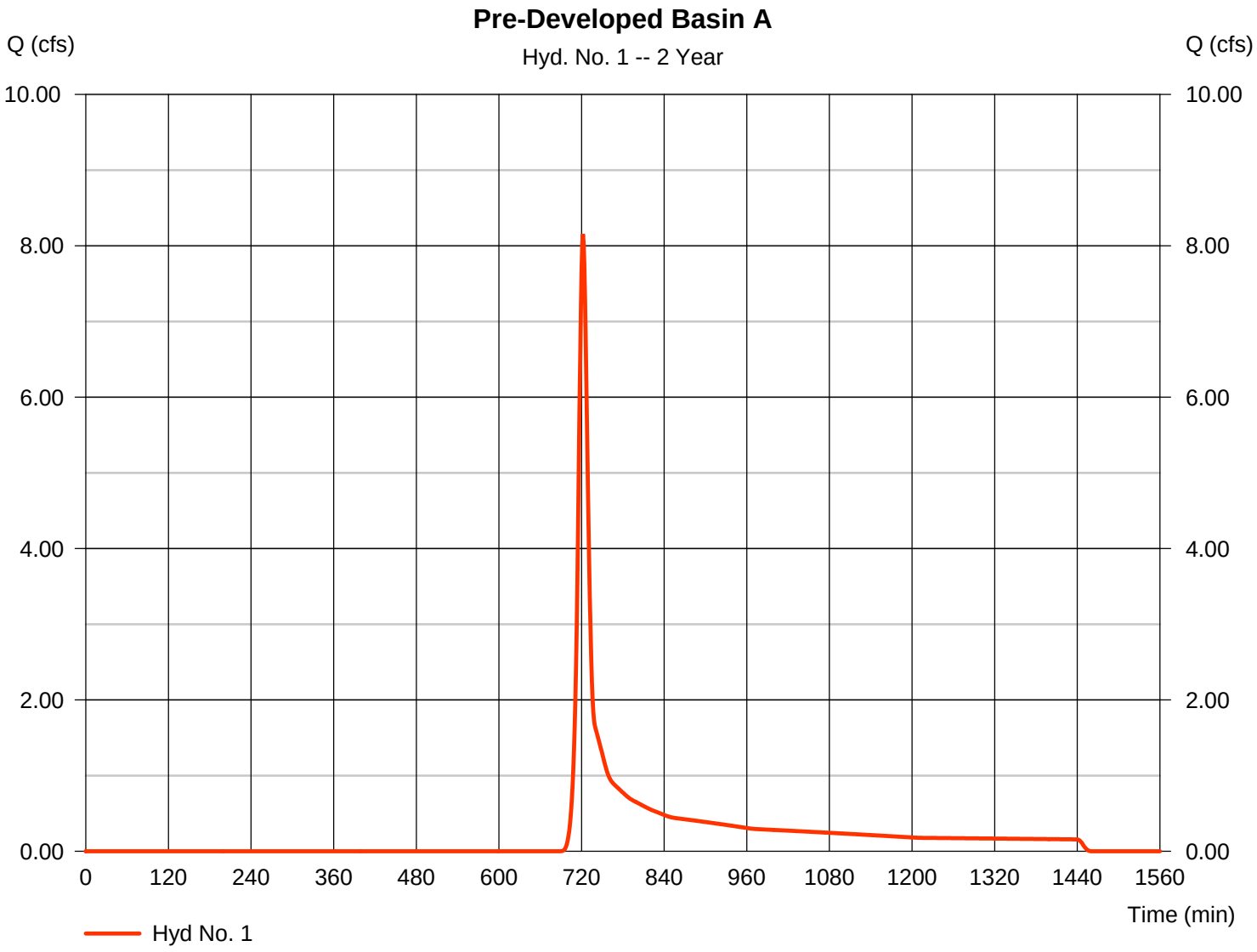
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.155 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	22,292 cuft
Drainage area	=	6.130 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.40 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



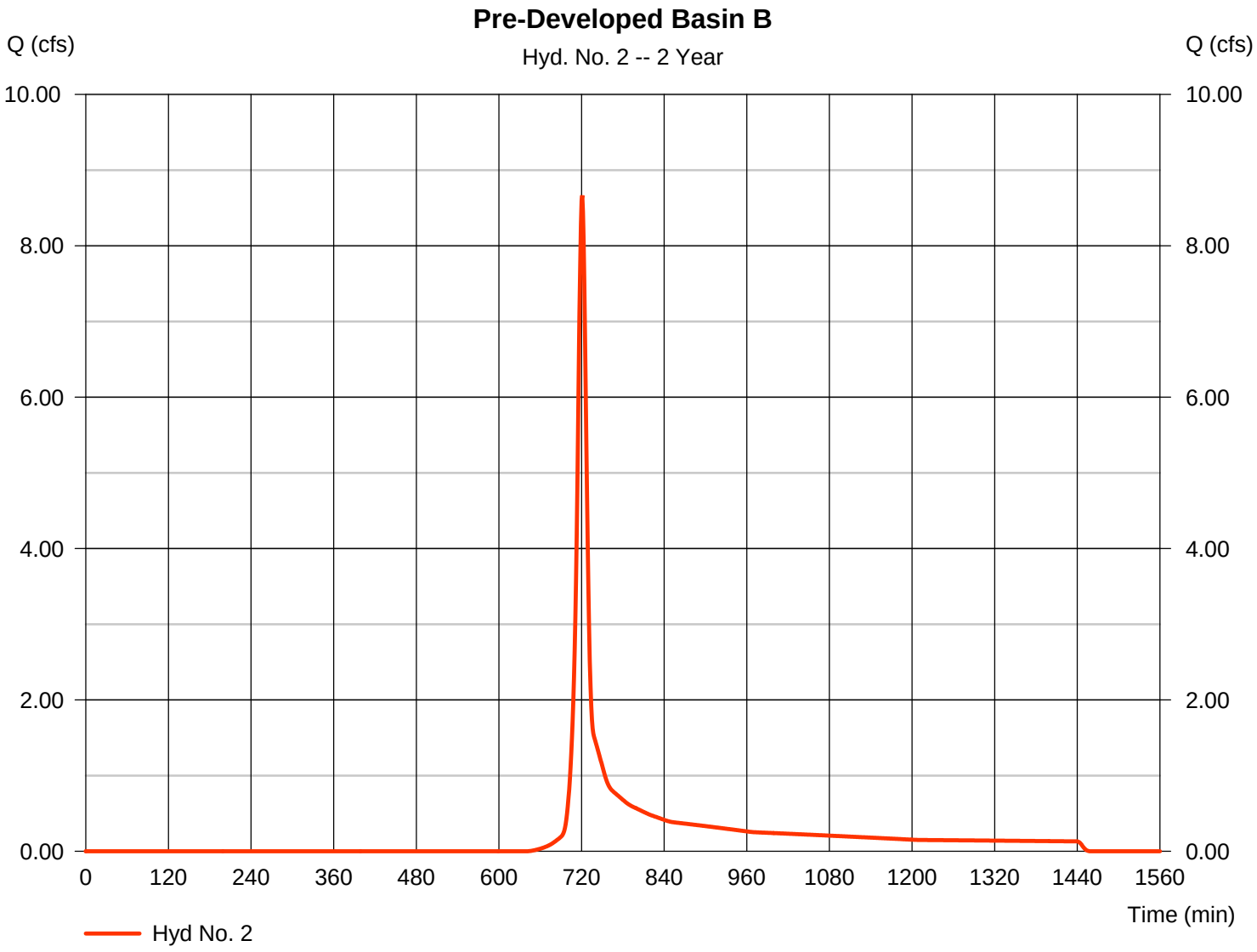
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.667 cfs
Storm frequency	=	2 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	21,365 cuft
Drainage area	=	4.180 ac	Curve number	=	70*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180

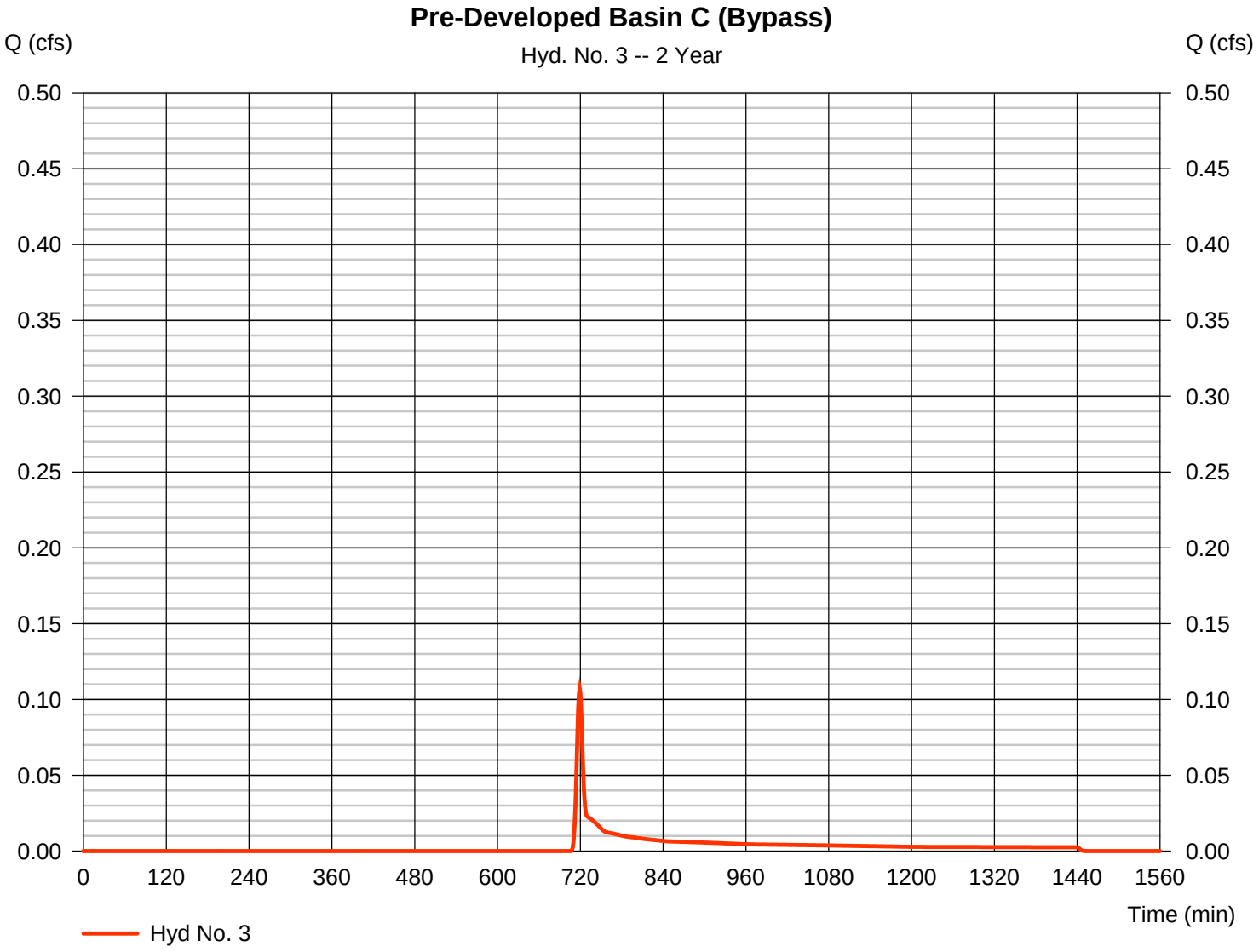


Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.107 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 273 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



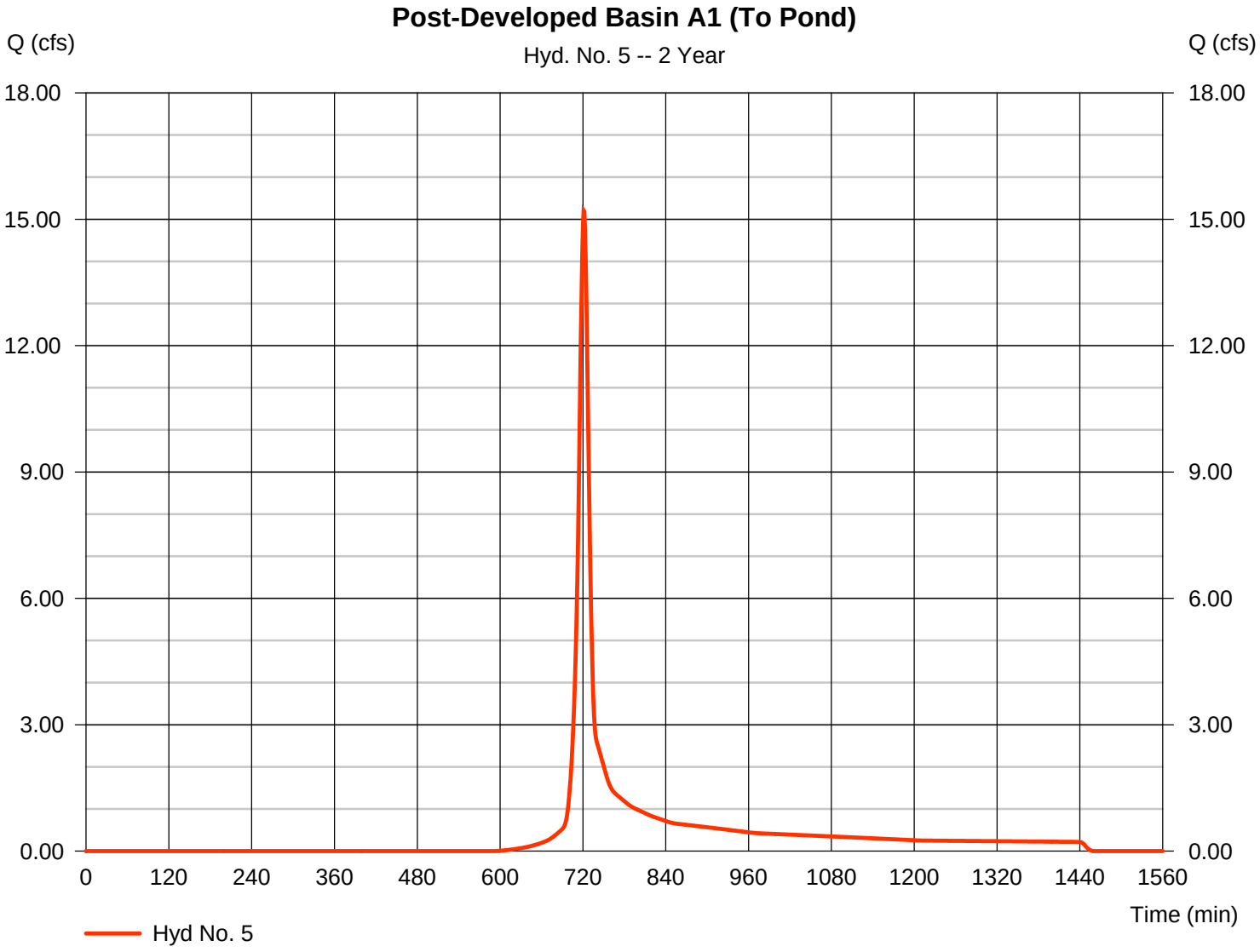
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	= SCS Runoff	Peak discharge	= 15.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 38,742 cuft
Drainage area	= 6.550 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



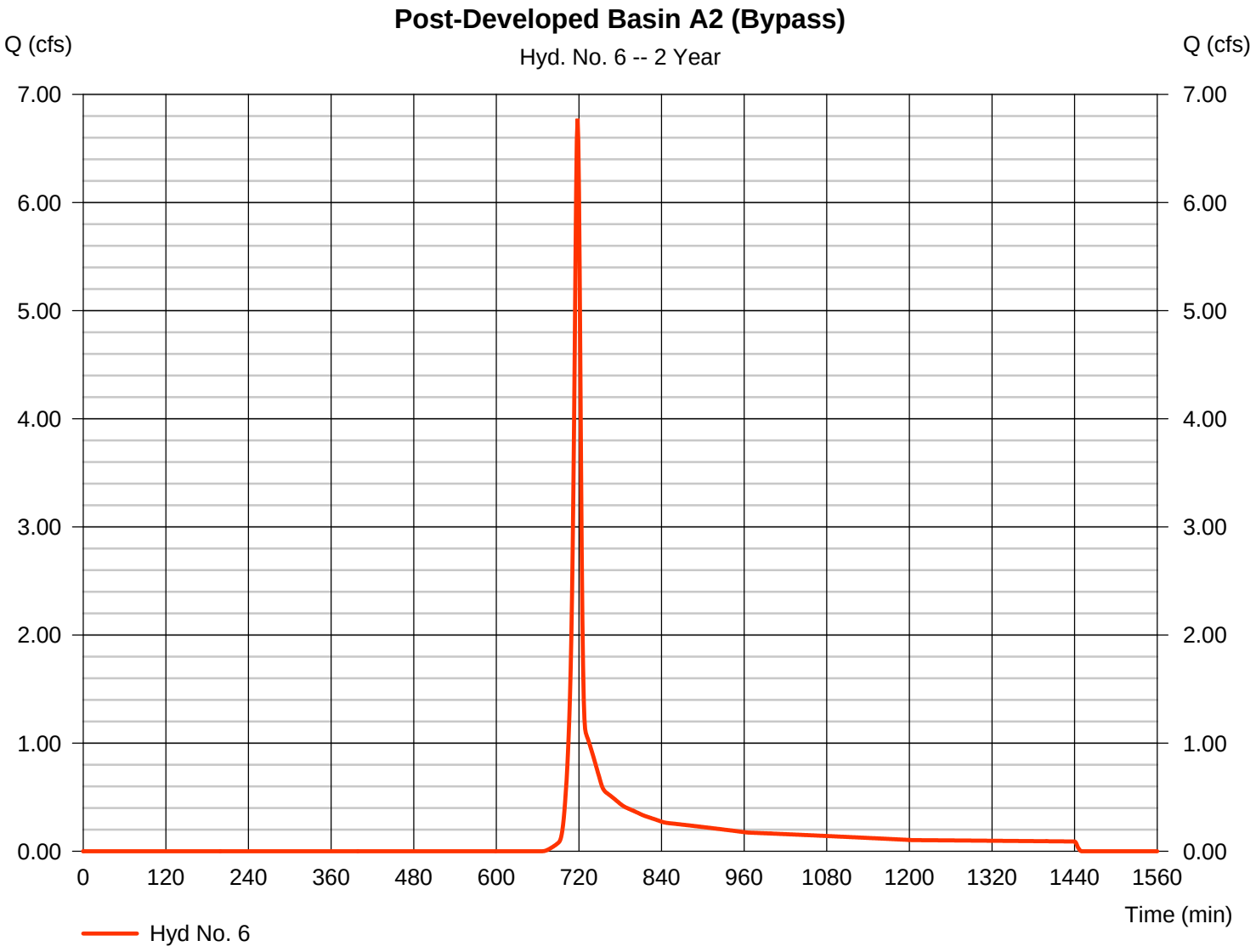
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.774 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 13,859 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



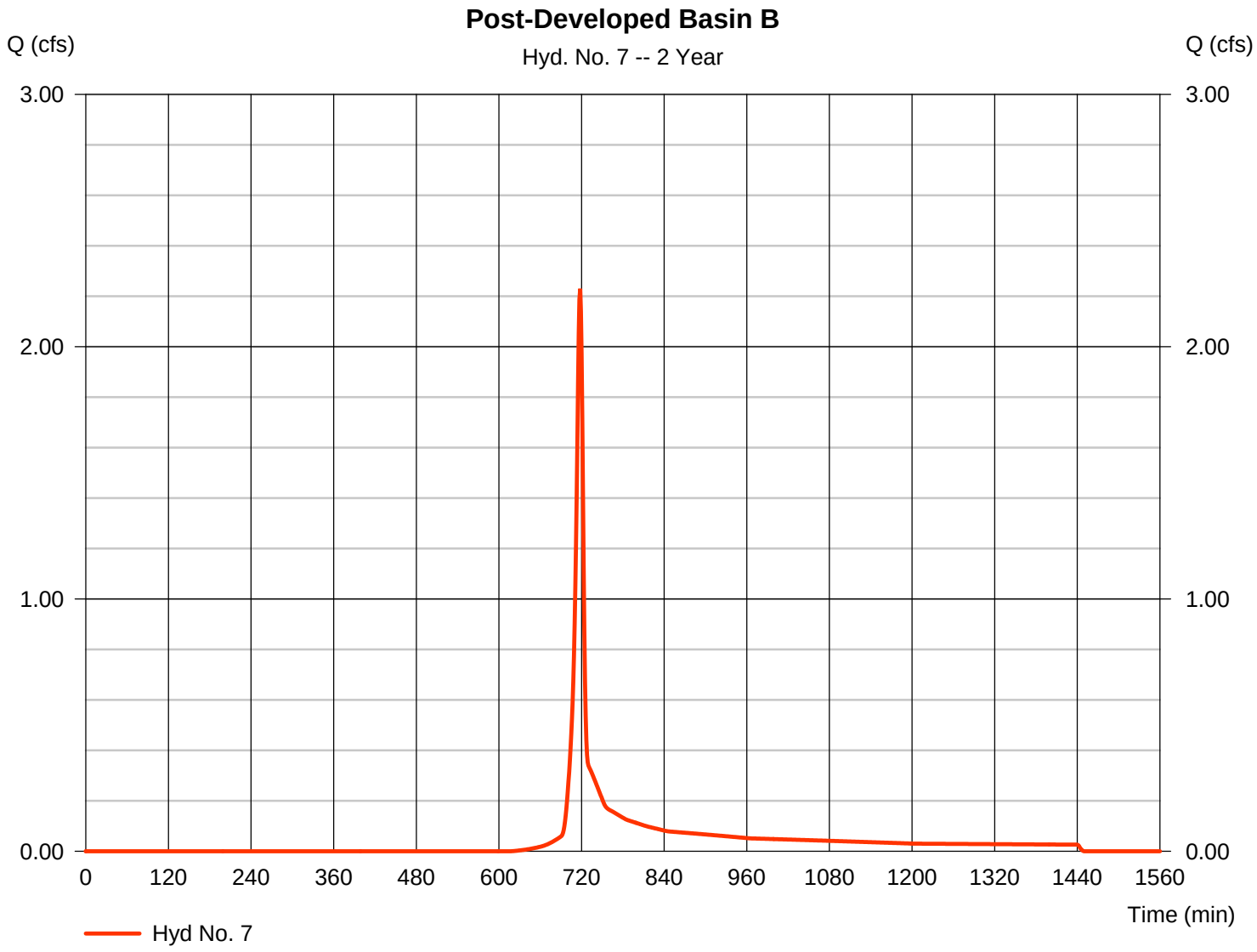
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.230 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	4,484 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



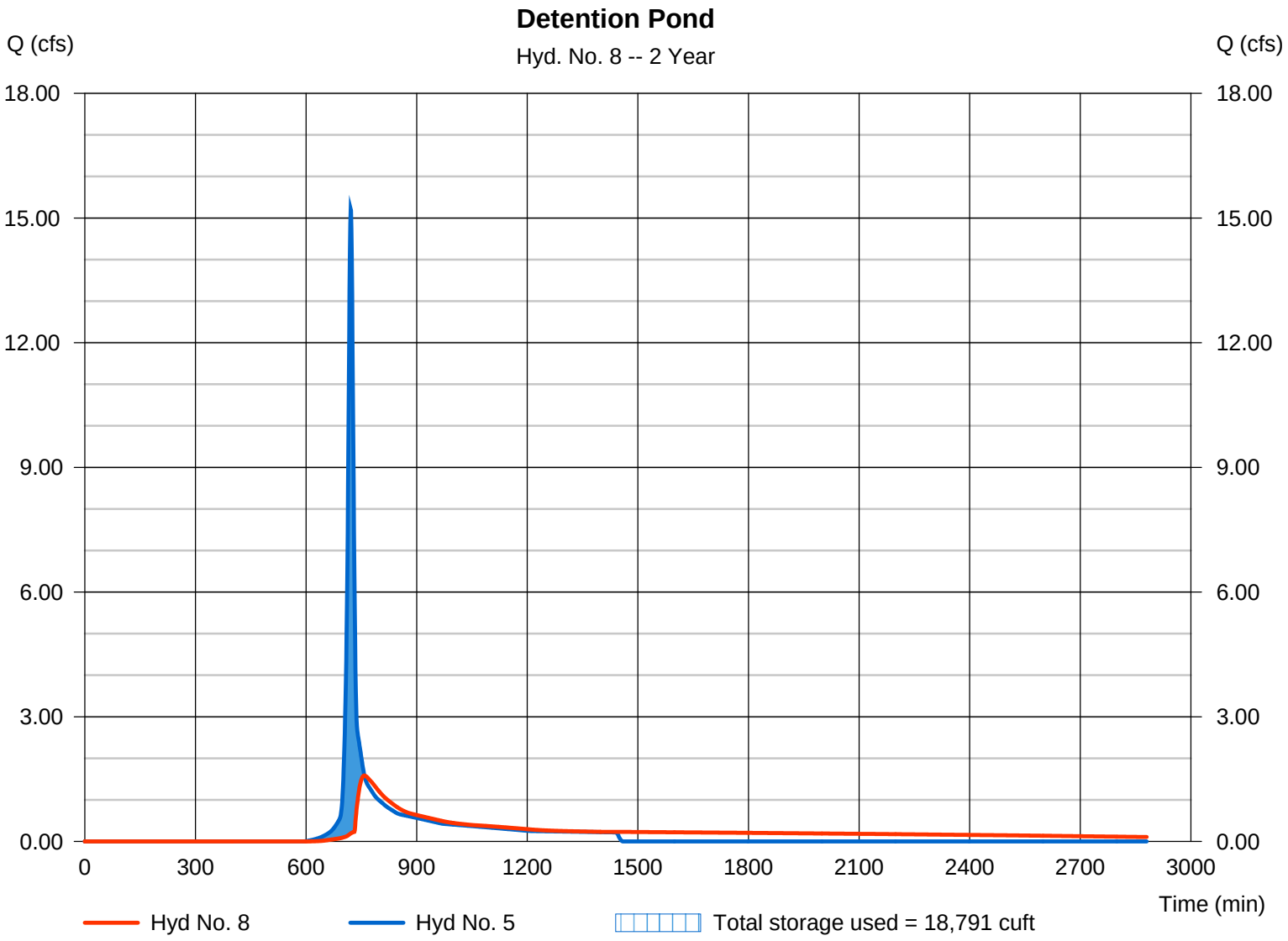
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	1.586 cfs
Storm frequency	=	2 yrs	Time to peak	=	758 min
Time interval	=	1 min	Hyd. volume	=	37,171 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total)	Max. Elevation	=	1416.32 ft
Reservoir name	=	Detention Pond	Max. Storage	=	18,791 cuft

Storage Indication method used.

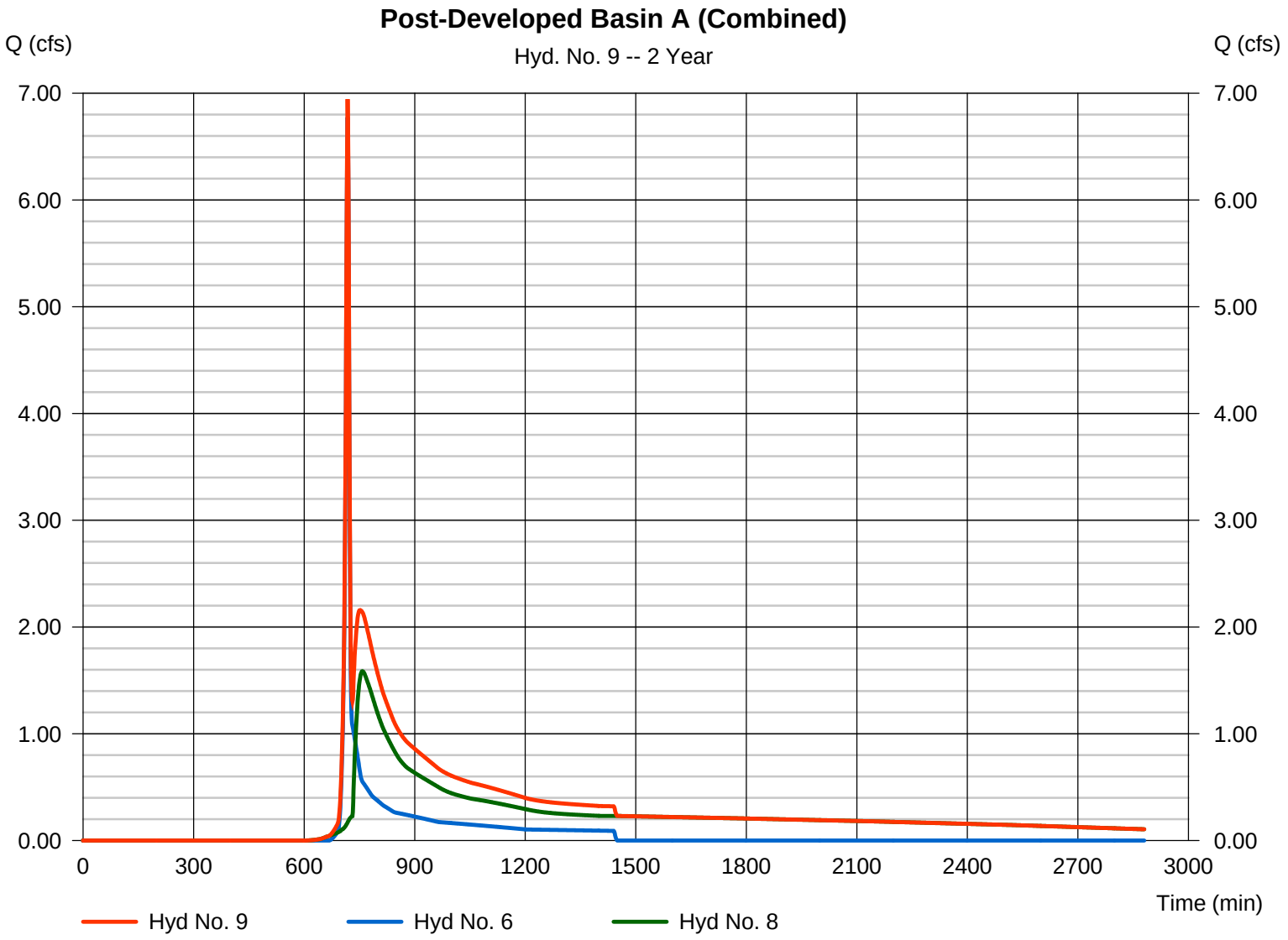


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	=	Combine	Peak discharge	=	6.945 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	51,030 cuft
Inflow hyds.	=	6, 8	Contrib. drain. area	=	3.100 ac



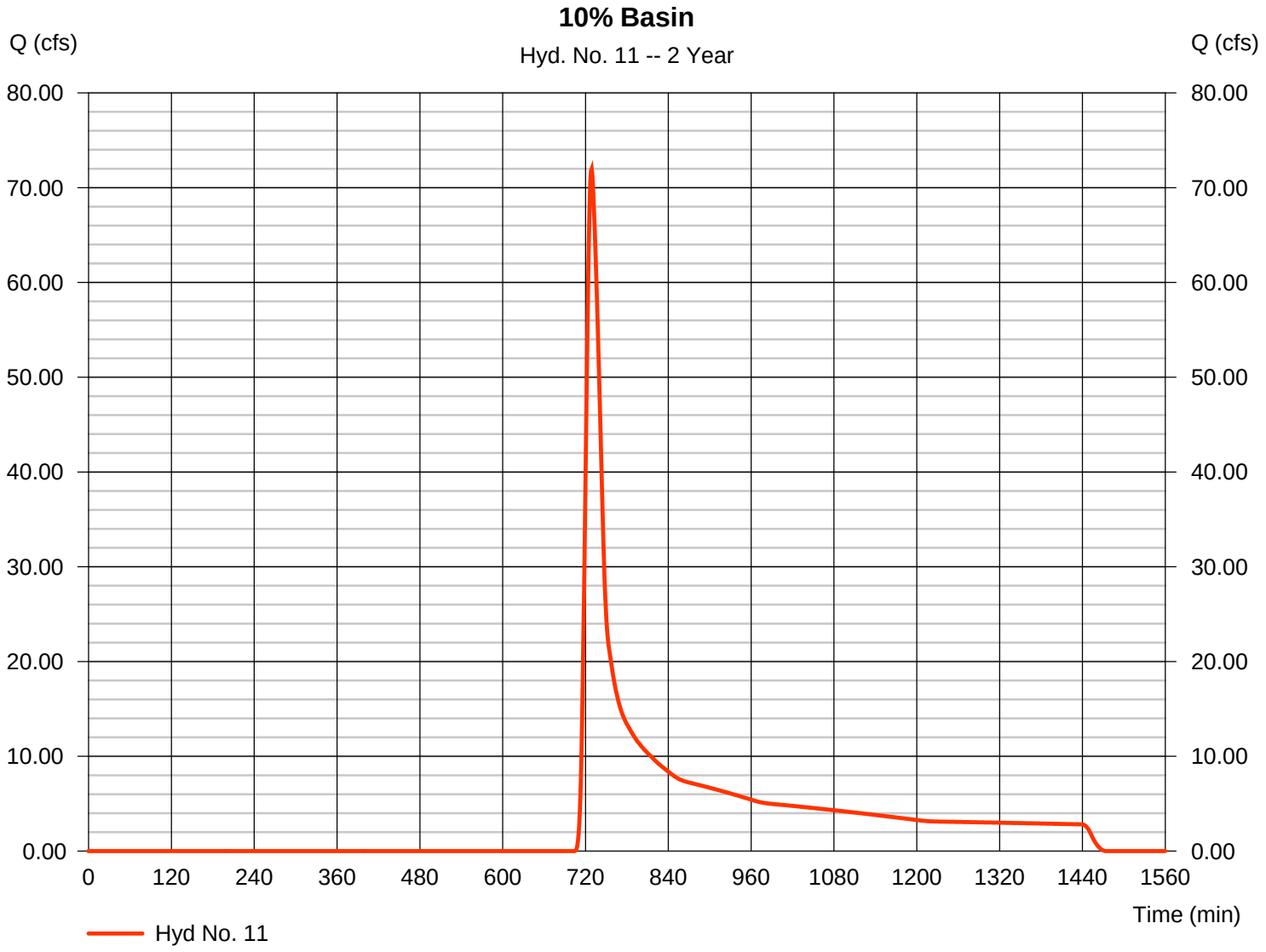
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	71.97 cfs
Storm frequency	=	2 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	329,813 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700

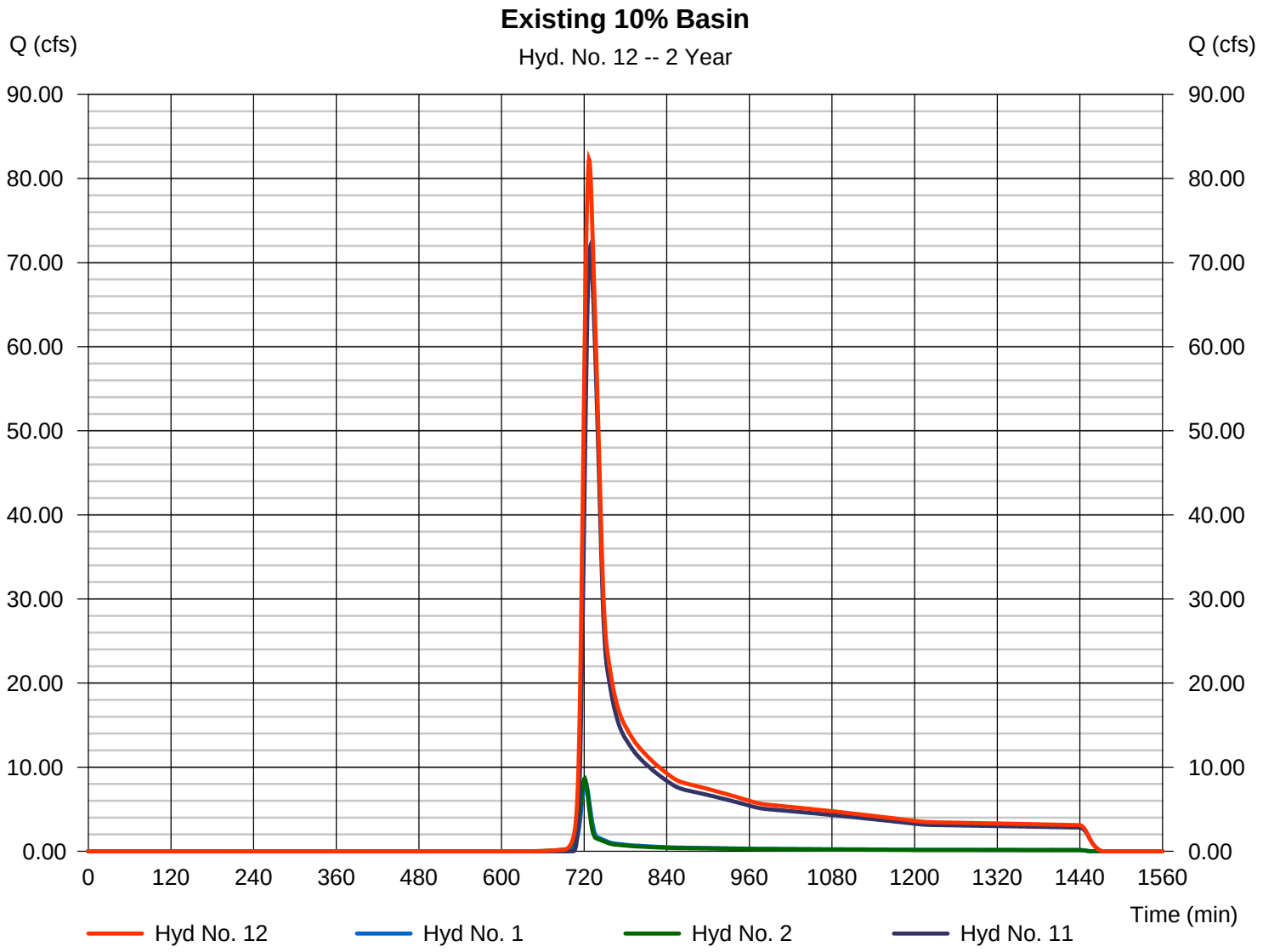


Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	82.28 cfs
Storm frequency	=	2 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	373,470 cuft
Inflow hyds.	=	1, 2, 11	Contrib. drain. area	=	148.010 ac

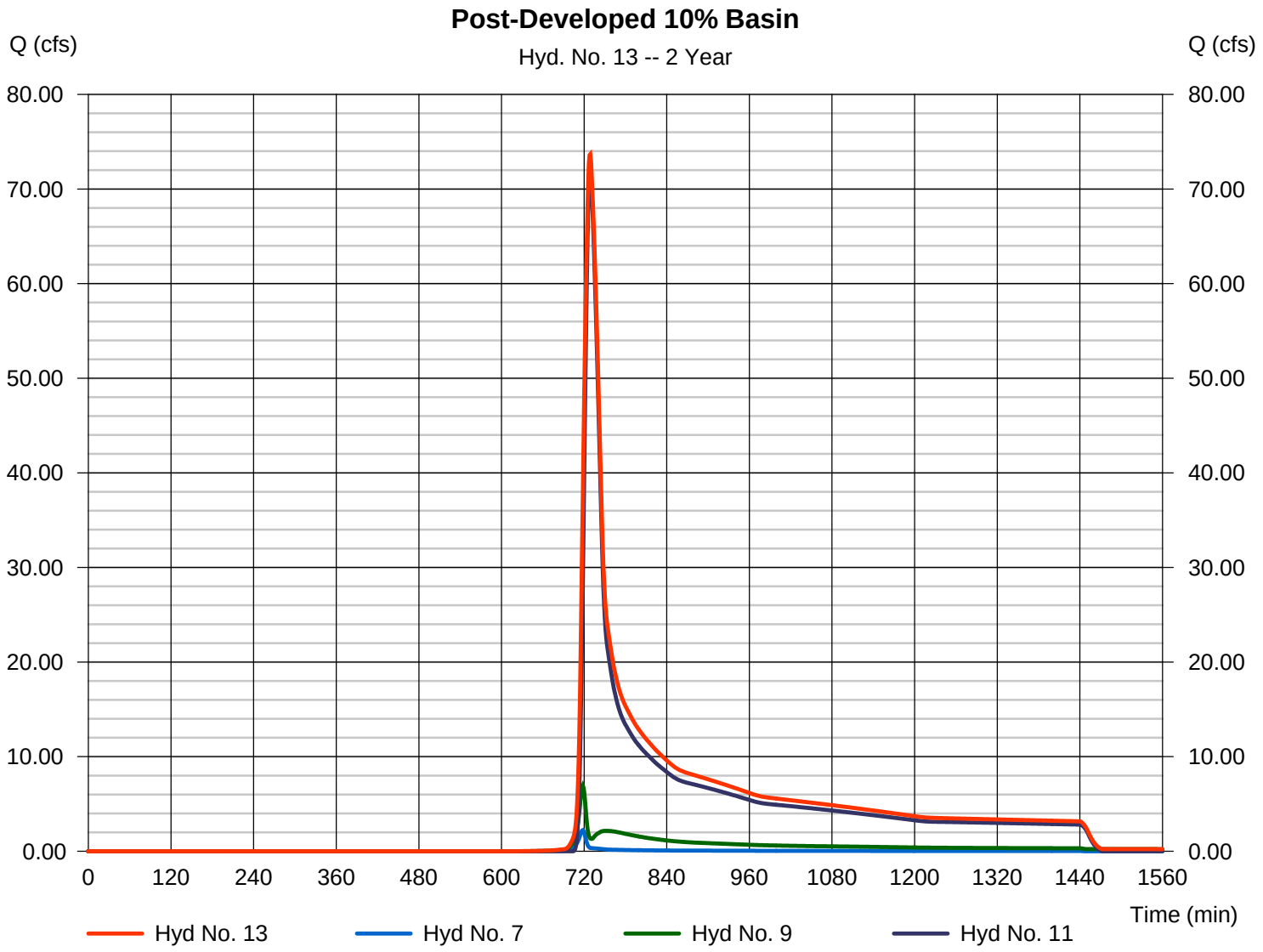


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	73.68 cfs
Storm frequency	=	2 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	385,328 cuft
Inflow hyds.	=	7, 9, 11	Contrib. drain. area	=	138.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	12.10	1	722	31,810	------	------	------	Pre-Developed Basin A
2	SCS Runoff	11.98	1	721	29,179	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.189	1	718	429	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	20.41	1	721	51,627	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	9.579	1	718	19,323	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	3.011	1	718	6,048	------	------	------	Post-Developed Basin B
8	Reservoir	5.385	1	734	49,978	5	1416.92	22,099	Detention Pond
9	Combine	9.775	1	718	69,301	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	126.53	1	728	504,520	------	------	------	10% Basin
12	Combine	142.23	1	727	565,508	1, 2, 11	------	------	Existing 10% Basin
13	Combine	132.28	1	728	579,869	7, 9, 11,	------	------	Post-Developed 10% Basin

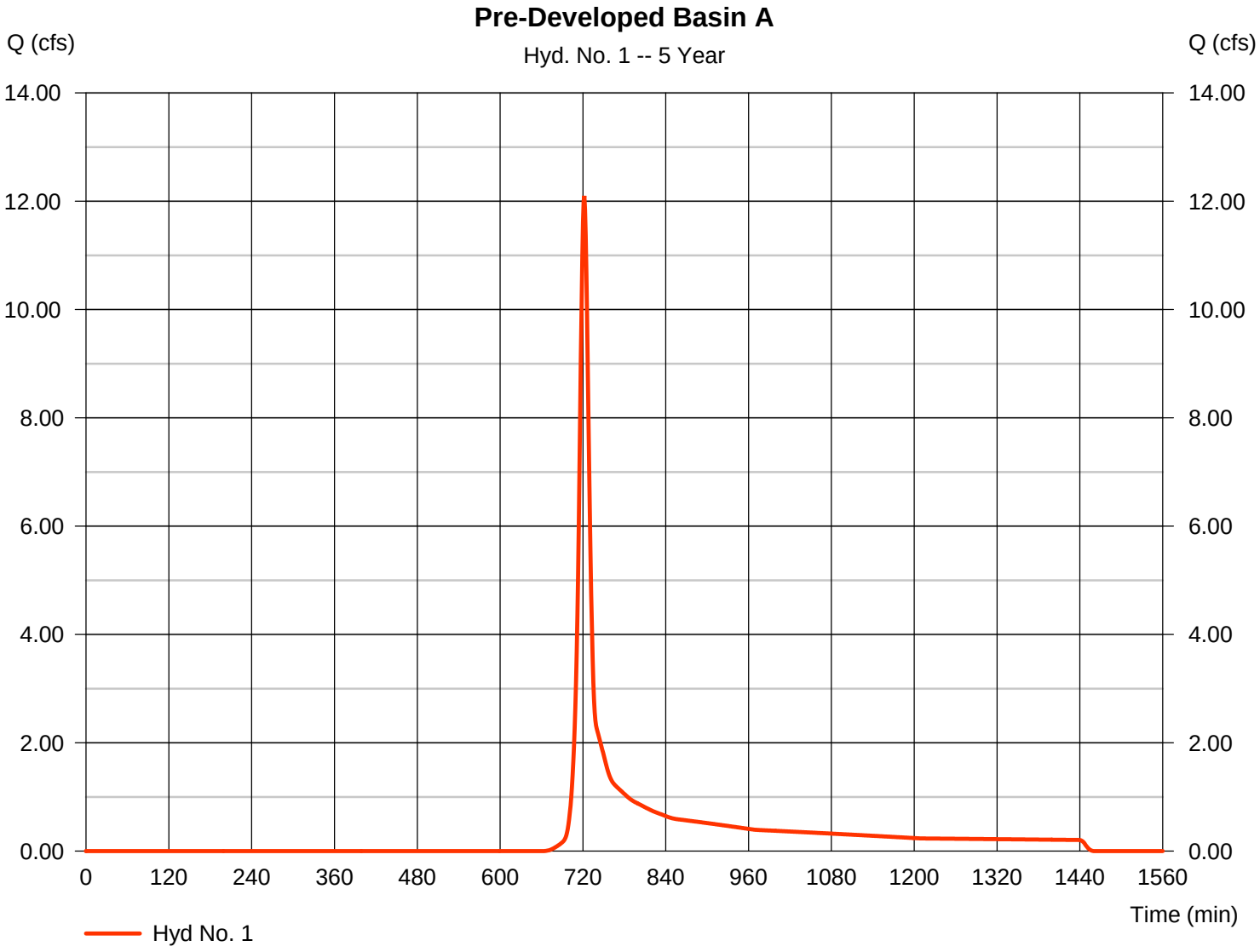
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	= SCS Runoff	Peak discharge	= 12.10 cfs
Storm frequency	= 5 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 31,810 cuft
Drainage area	= 6.130 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.40 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



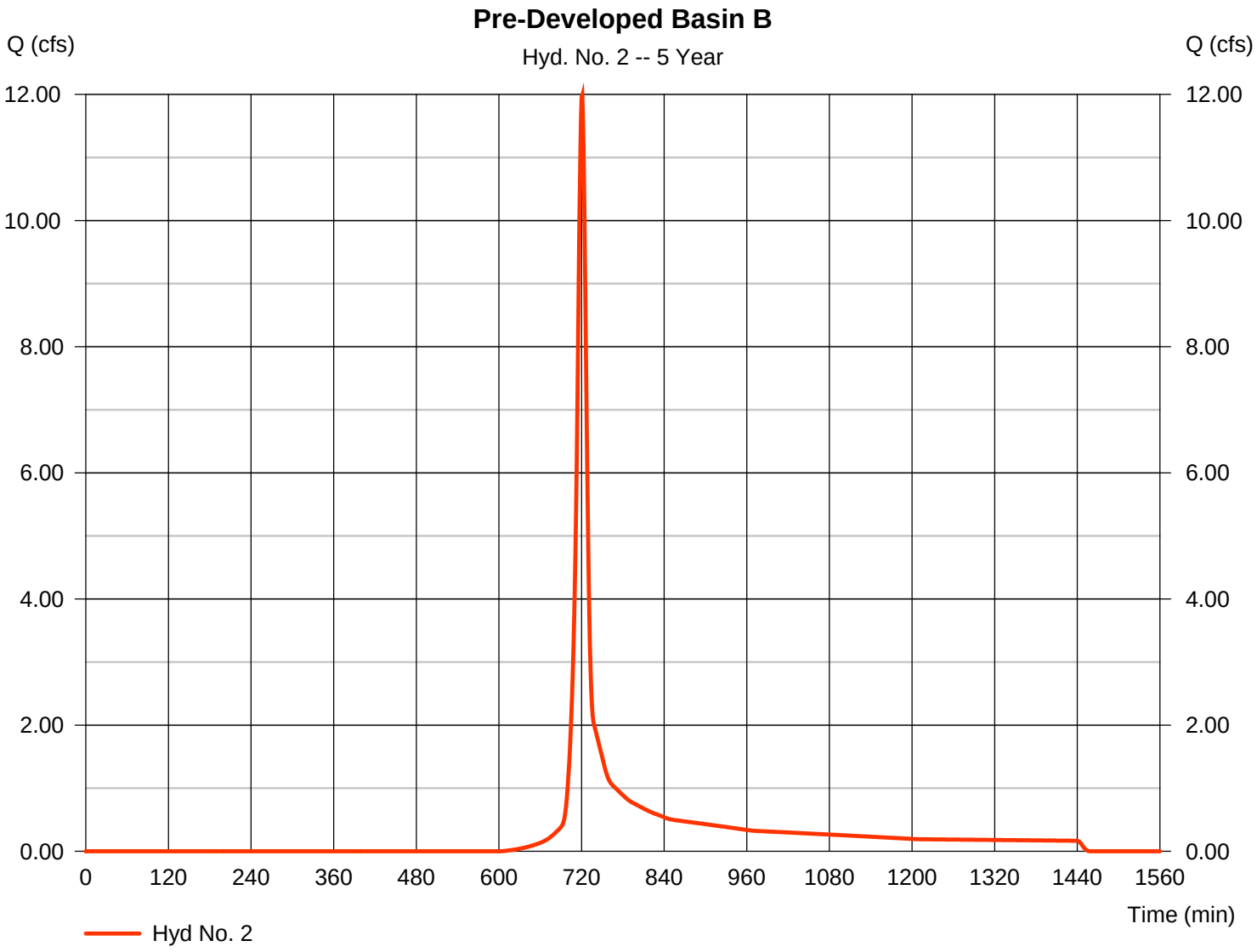
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	= SCS Runoff	Peak discharge	= 11.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 29,179 cuft
Drainage area	= 4.180 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.80 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180

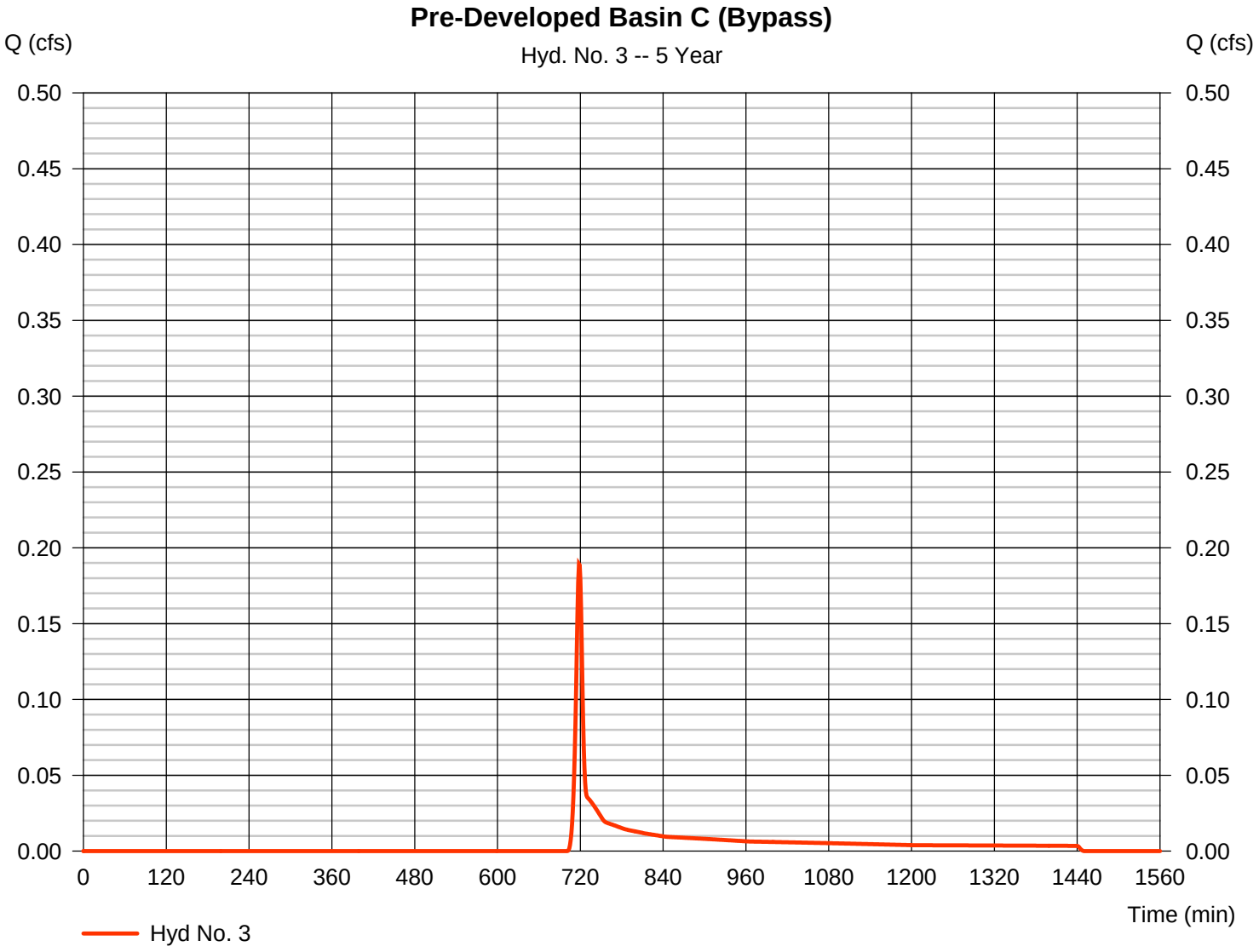


Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.189 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 429 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



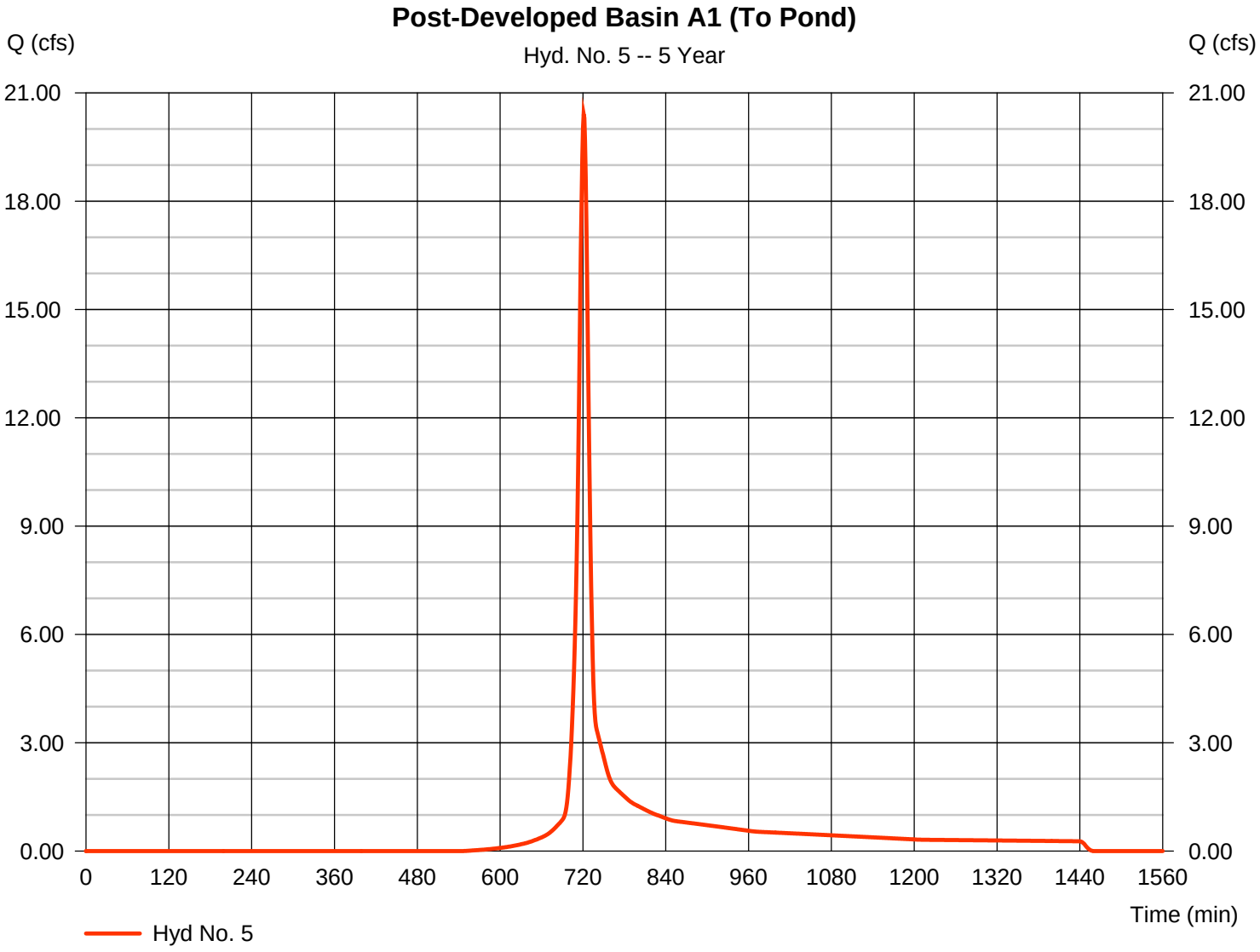
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	= SCS Runoff	Peak discharge	= 20.41 cfs
Storm frequency	= 5 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 51,627 cuft
Drainage area	= 6.550 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



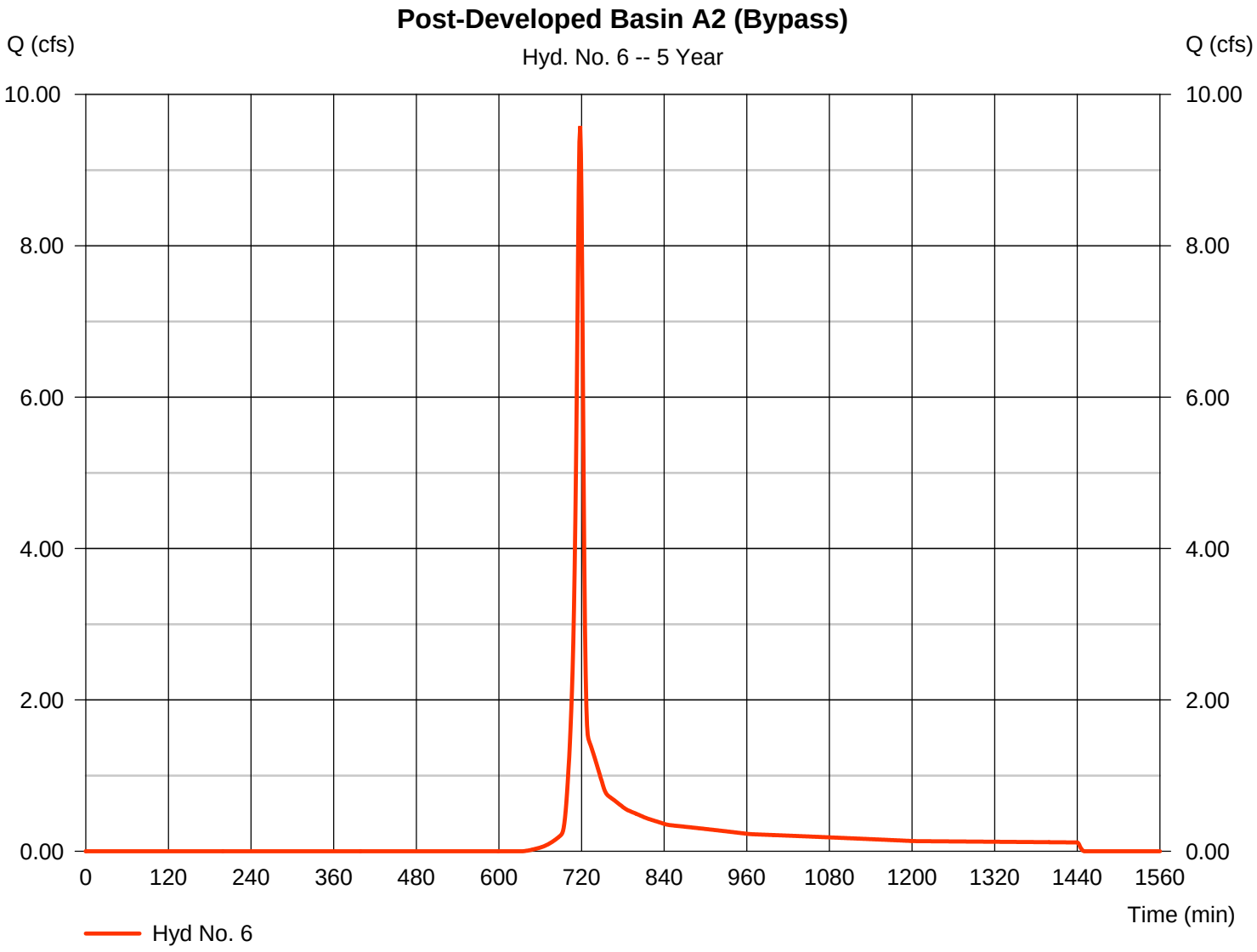
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.579 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 19,323 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



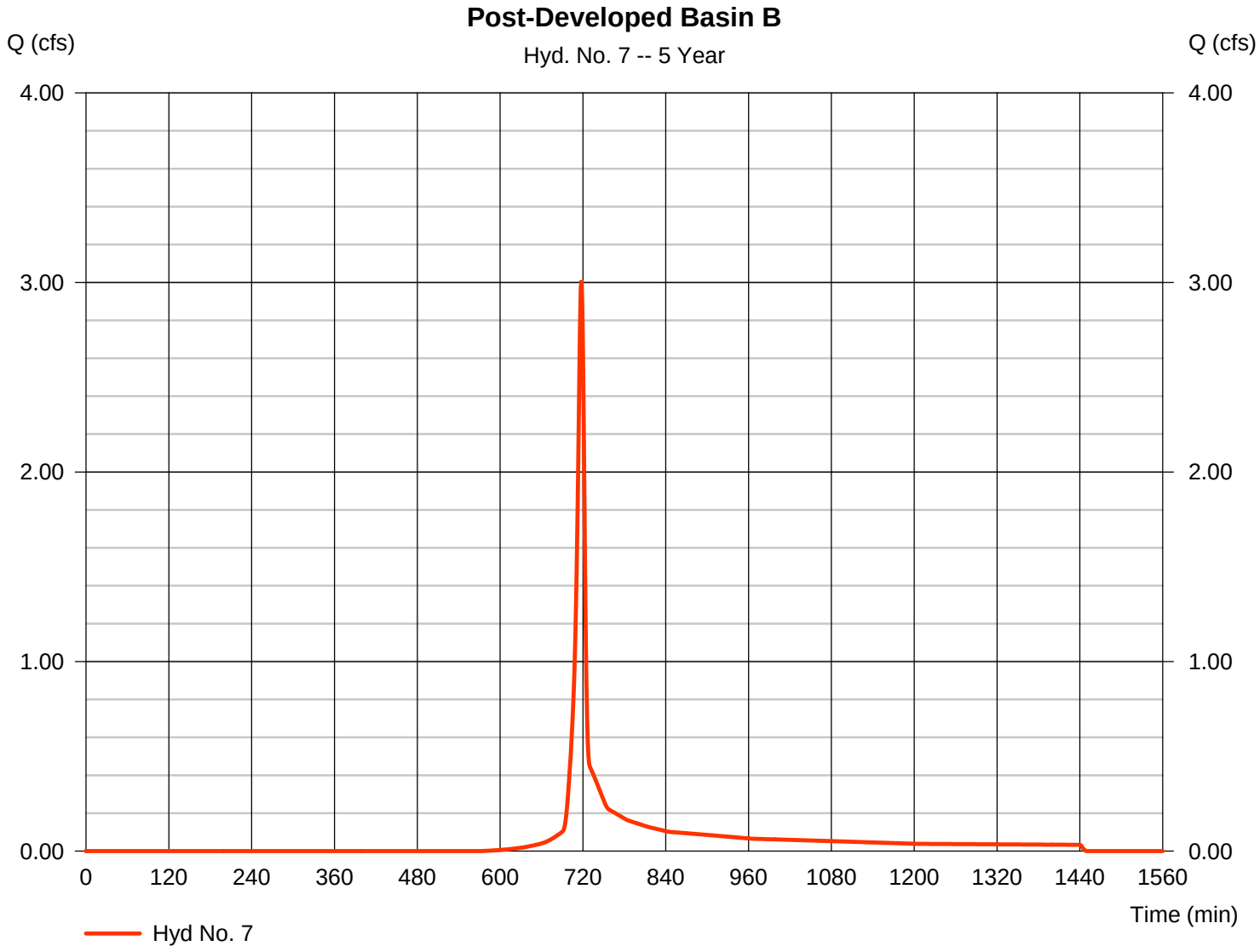
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.011 cfs
Storm frequency	=	5 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	6,048 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	4.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



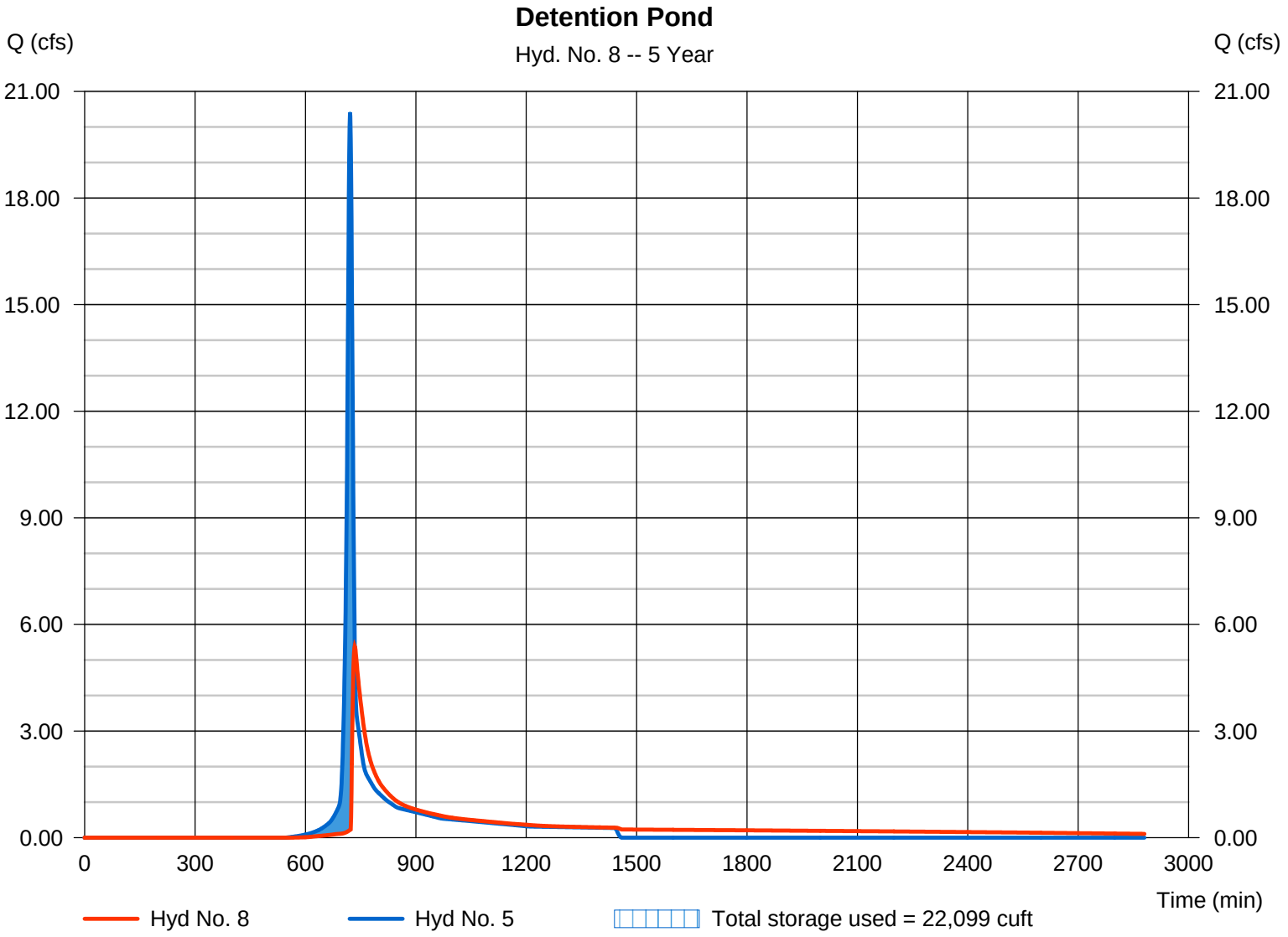
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	5.385 cfs
Storm frequency	=	5 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	49,978 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total)	Max. Elevation	=	1416.92 ft
Reservoir name	=	Detention Pond	Max. Storage	=	22,099 cuft

Storage Indication method used.

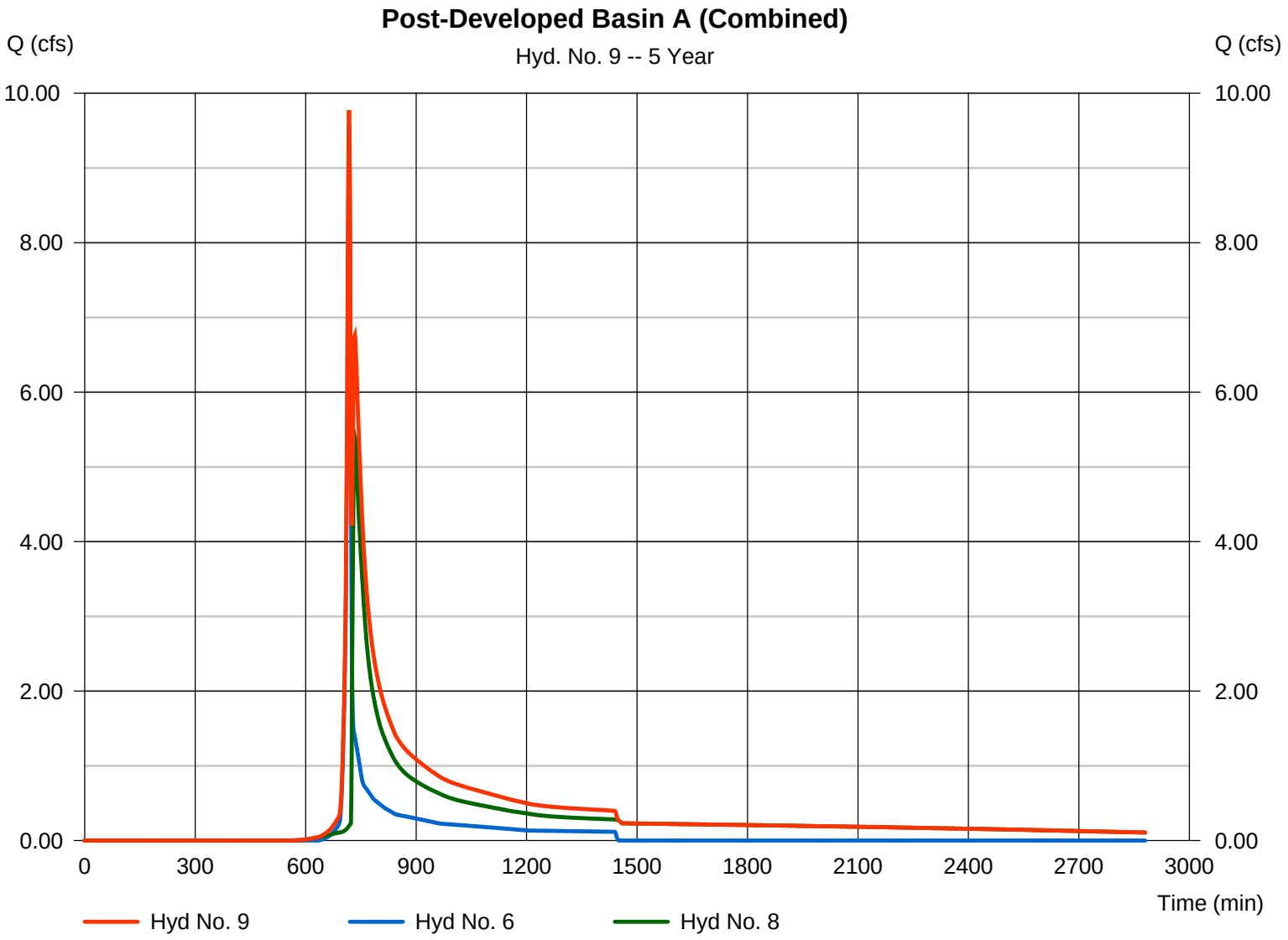


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	= Combine	Peak discharge	= 9.775 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 69,301 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 3.100 ac



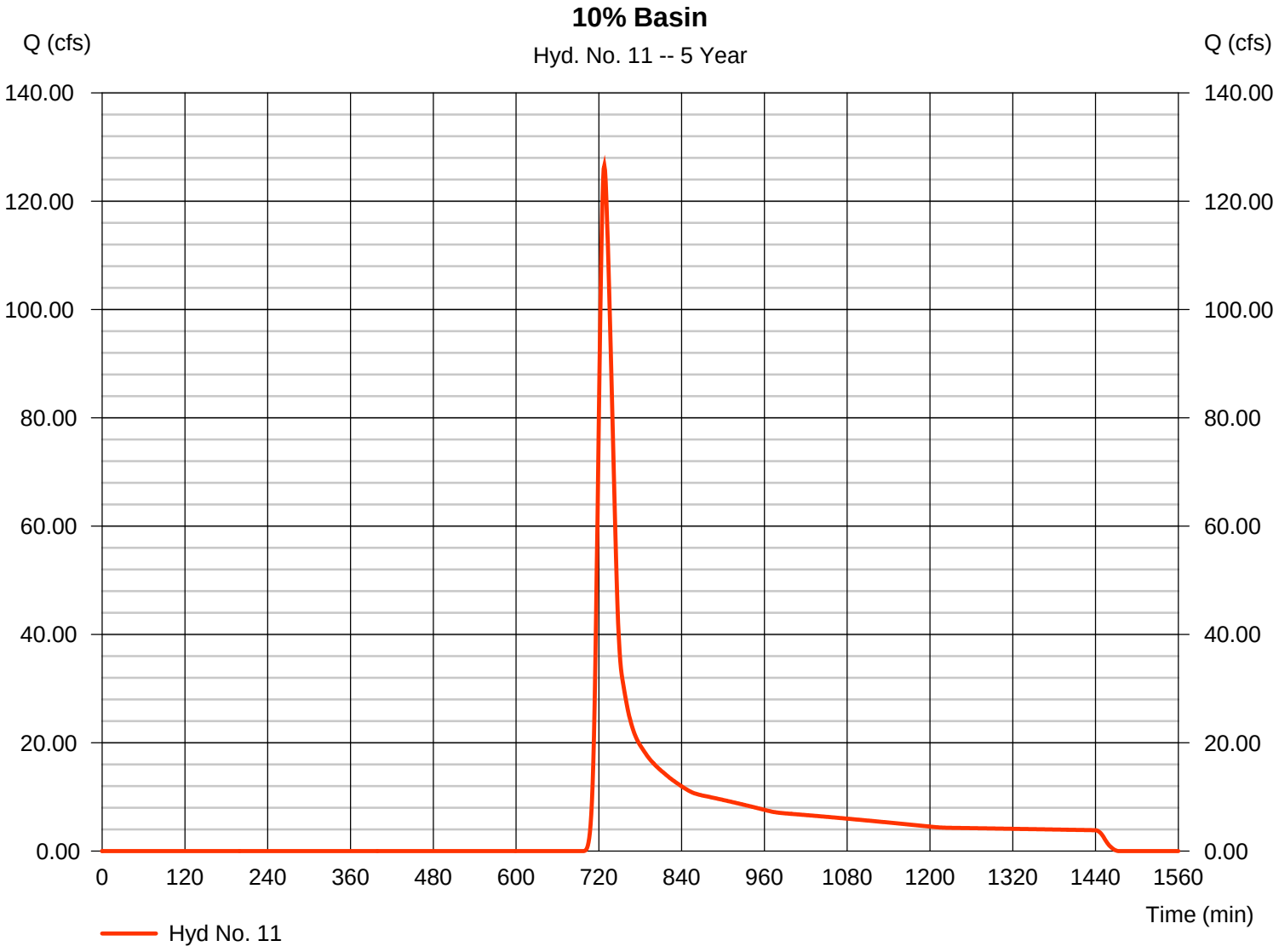
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	126.53 cfs
Storm frequency	=	5 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	504,520 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	4.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700

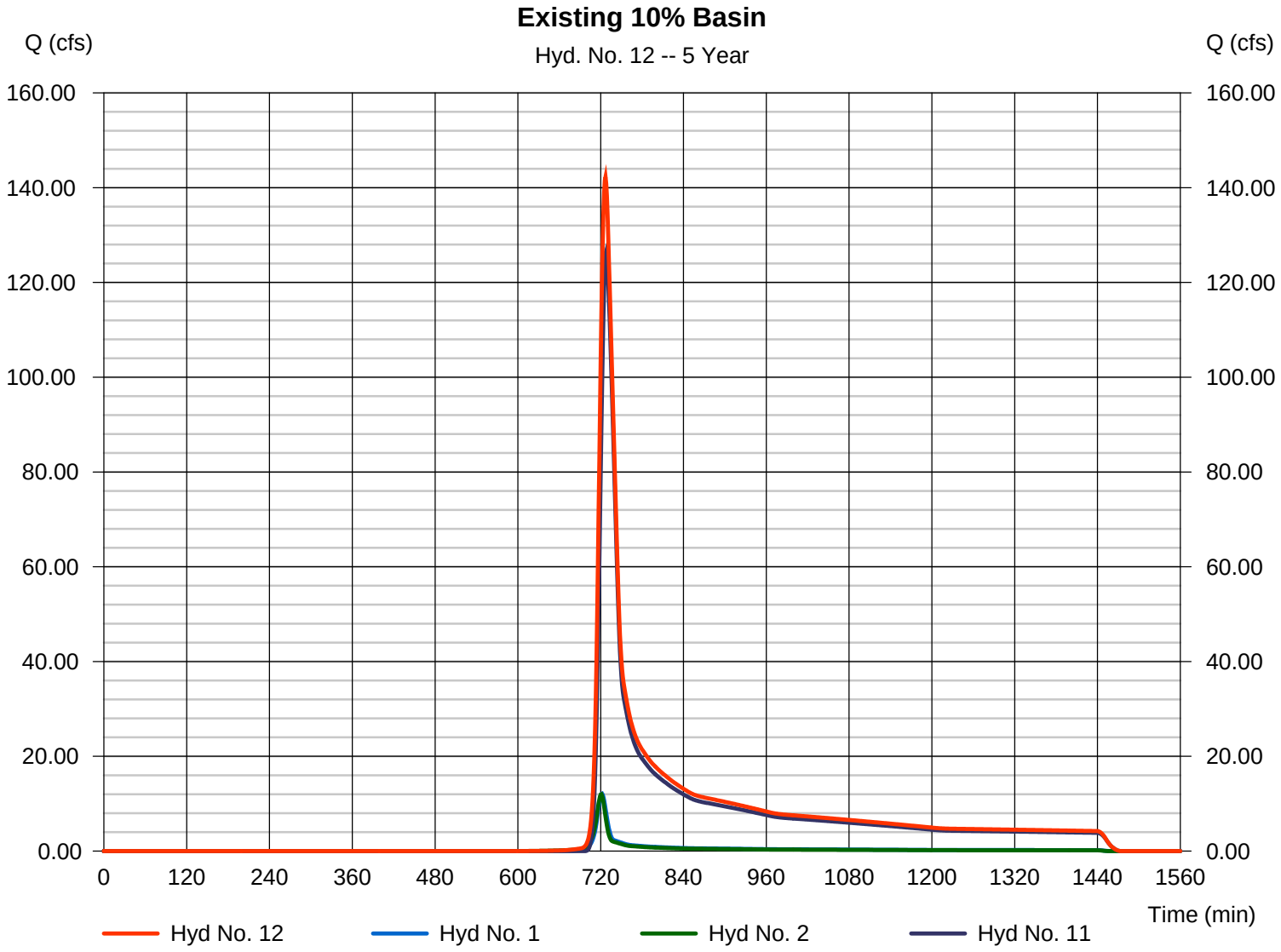


Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	= Combine	Peak discharge	= 142.23 cfs
Storm frequency	= 5 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 565,508 cuft
Inflow hyds.	= 1, 2, 11	Contrib. drain. area	= 148.010 ac

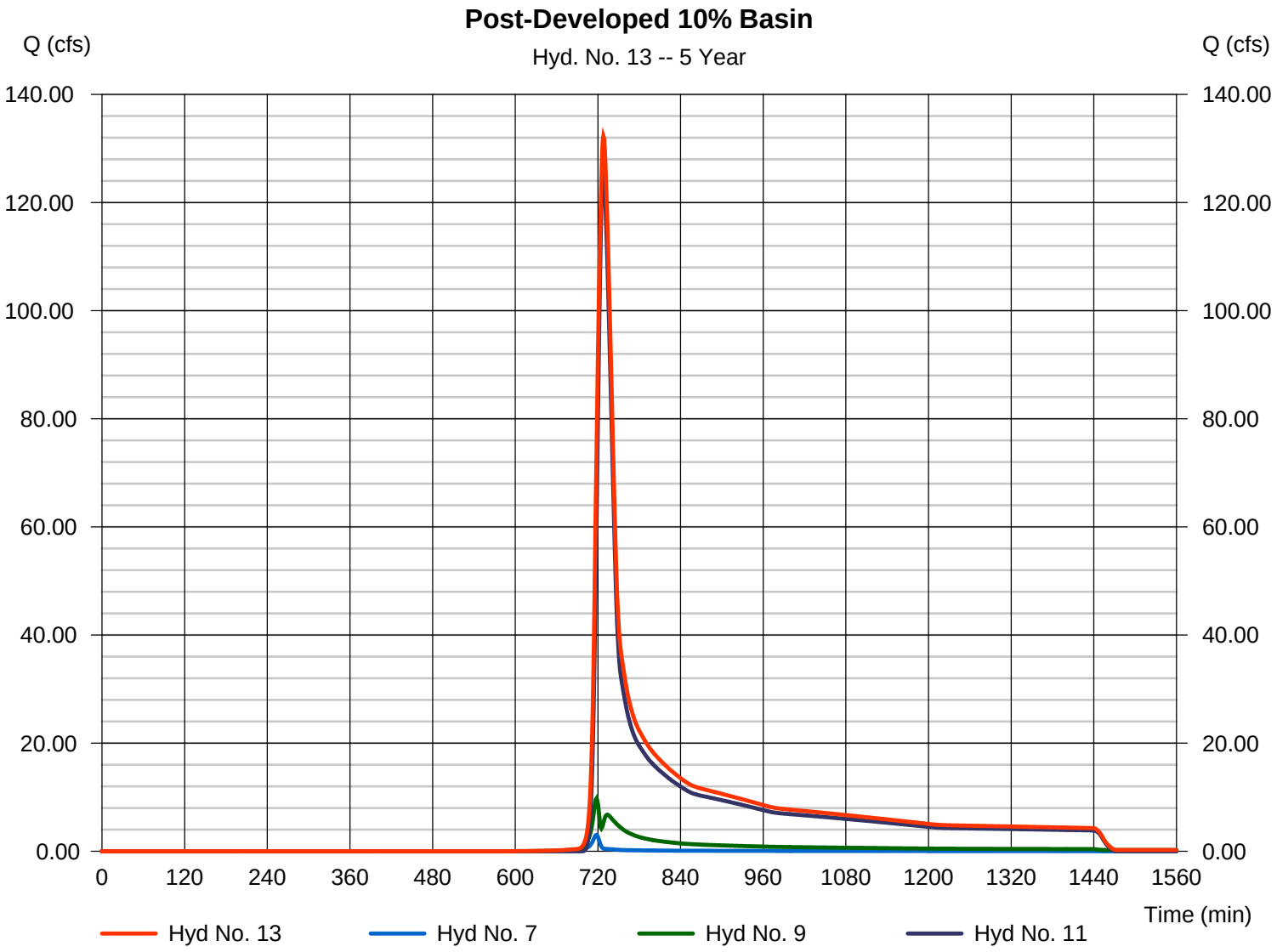


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	= Combine	Peak discharge	= 132.28 cfs
Storm frequency	= 5 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 579,869 cuft
Inflow hyds.	= 7, 9, 11	Contrib. drain. area	= 138.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	16.36	1	722	42,226	------	------	------	Pre-Developed Basin A
2	SCS Runoff	15.47	1	720	37,525	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.285	1	718	608	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	25.82	1	721	65,197	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	12.56	1	718	25,227	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	3.826	1	718	7,705	------	------	------	Post-Developed Basin B
8	Reservoir	10.70	1	731	63,489	5	1417.53	25,842	Detention Pond
9	Combine	12.78	1	718	88,716	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	189.68	1	727	702,713	------	------	------	10% Basin
12	Combine	210.92	1	726	782,465	1, 2, 11	------	------	Existing 10% Basin
13	Combine	202.14	1	727	799,135	7, 9, 11,	------	------	Post-Developed 10% Basin

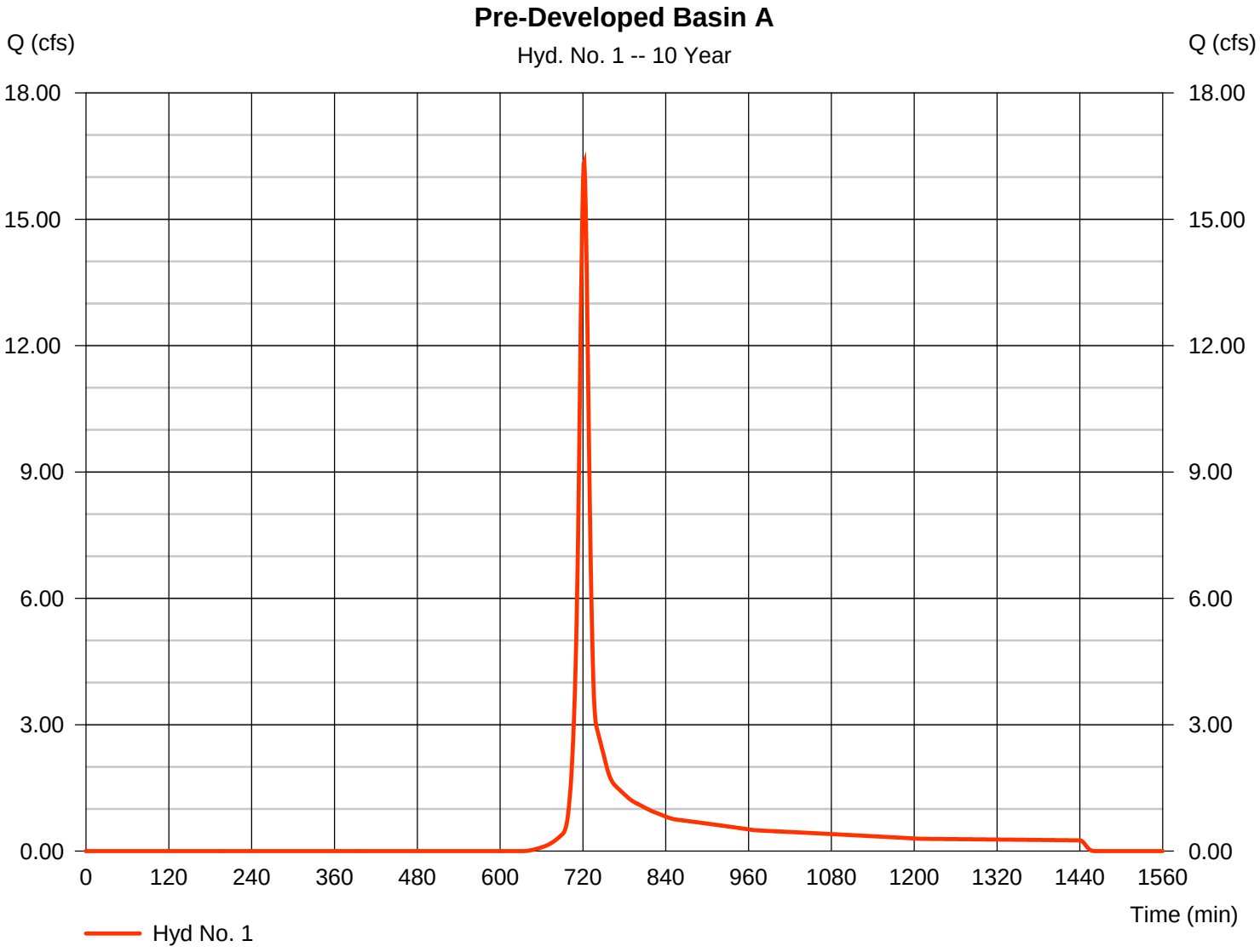
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.36 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	42,226 cuft
Drainage area	=	6.130 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.40 min
Total precip.	=	5.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



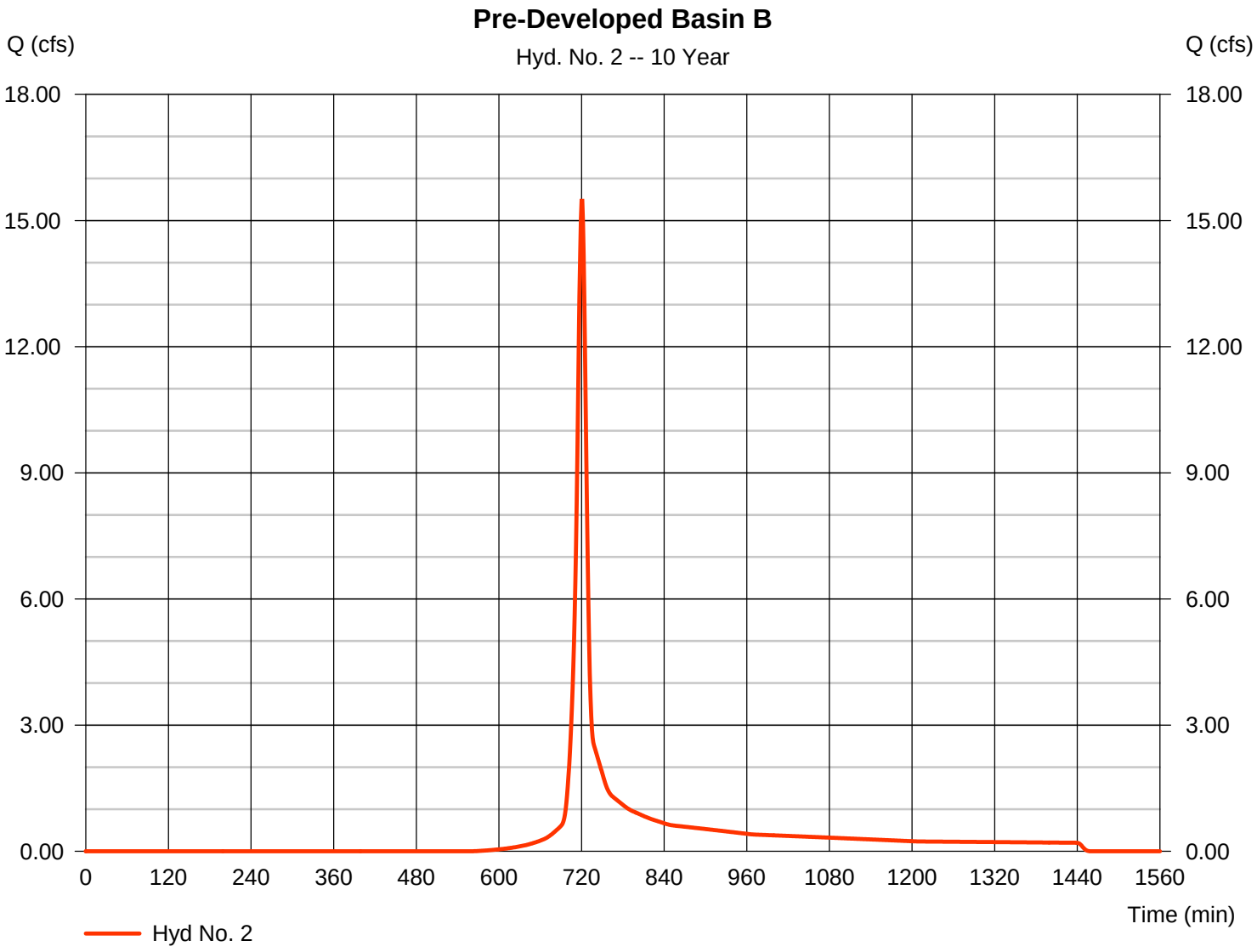
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	37,525 cuft
Drainage area	=	4.180 ac	Curve number	=	70*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	5.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180

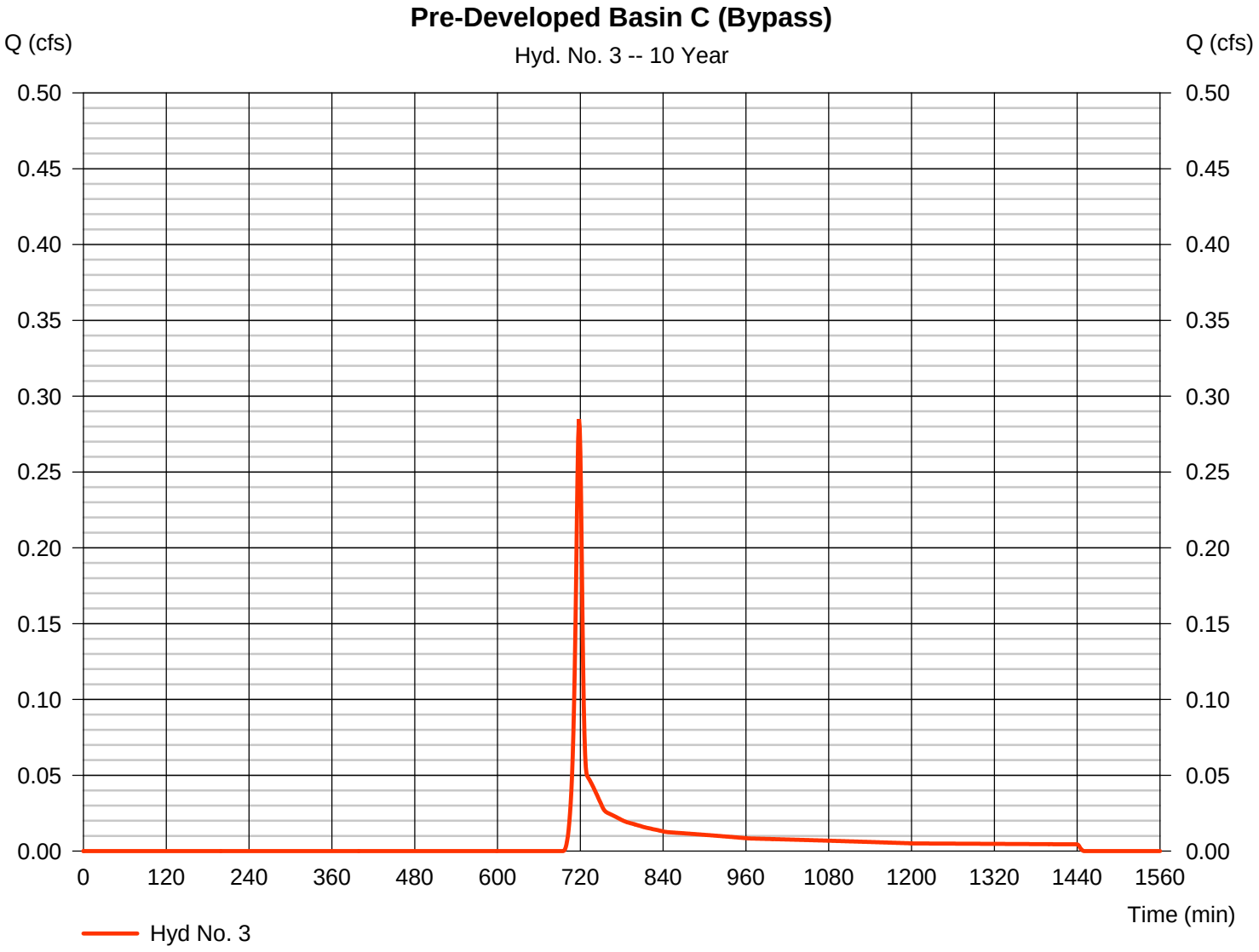


Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.285 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 608 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



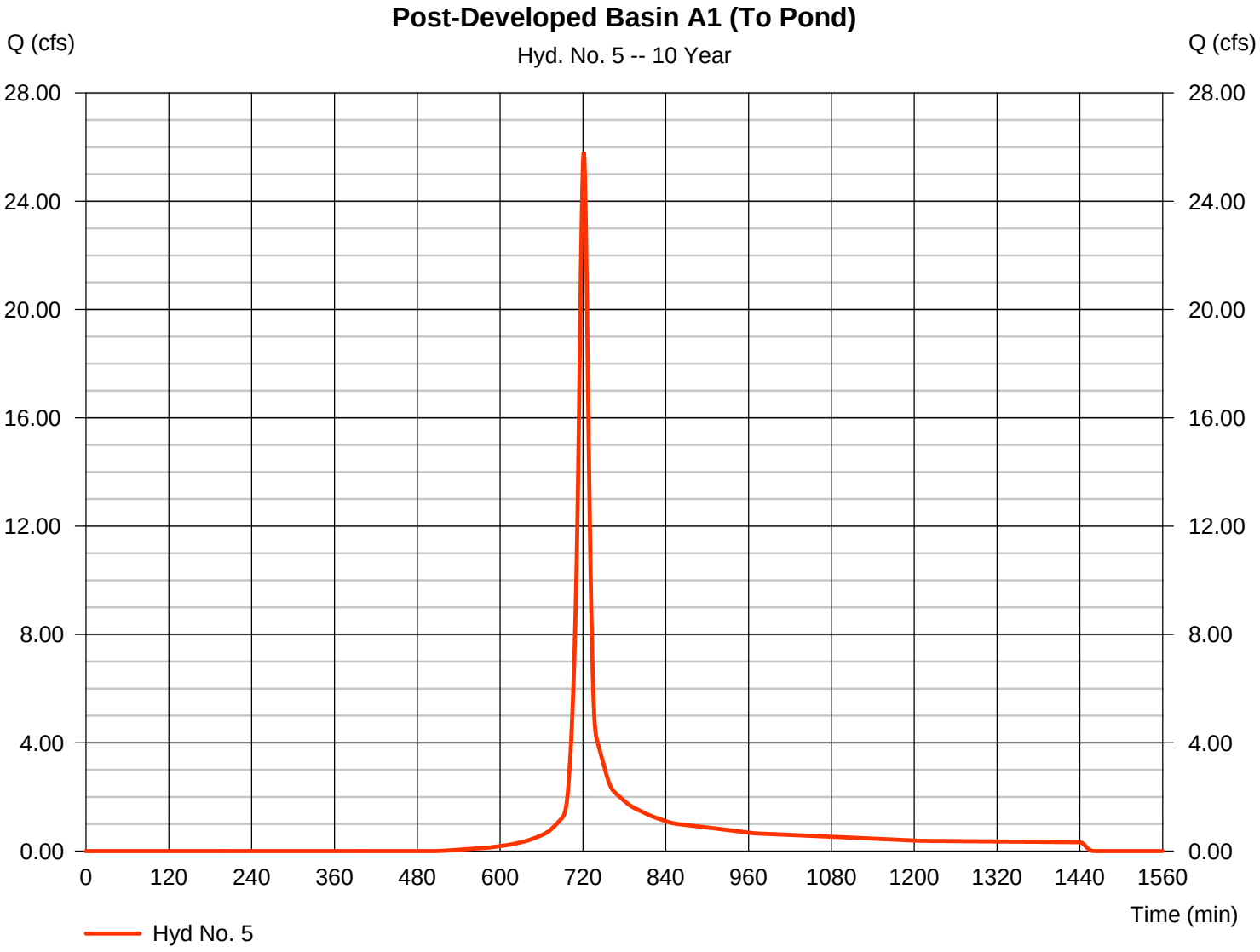
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.82 cfs
Storm frequency	=	10 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	65,197 cuft
Drainage area	=	6.550 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	5.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



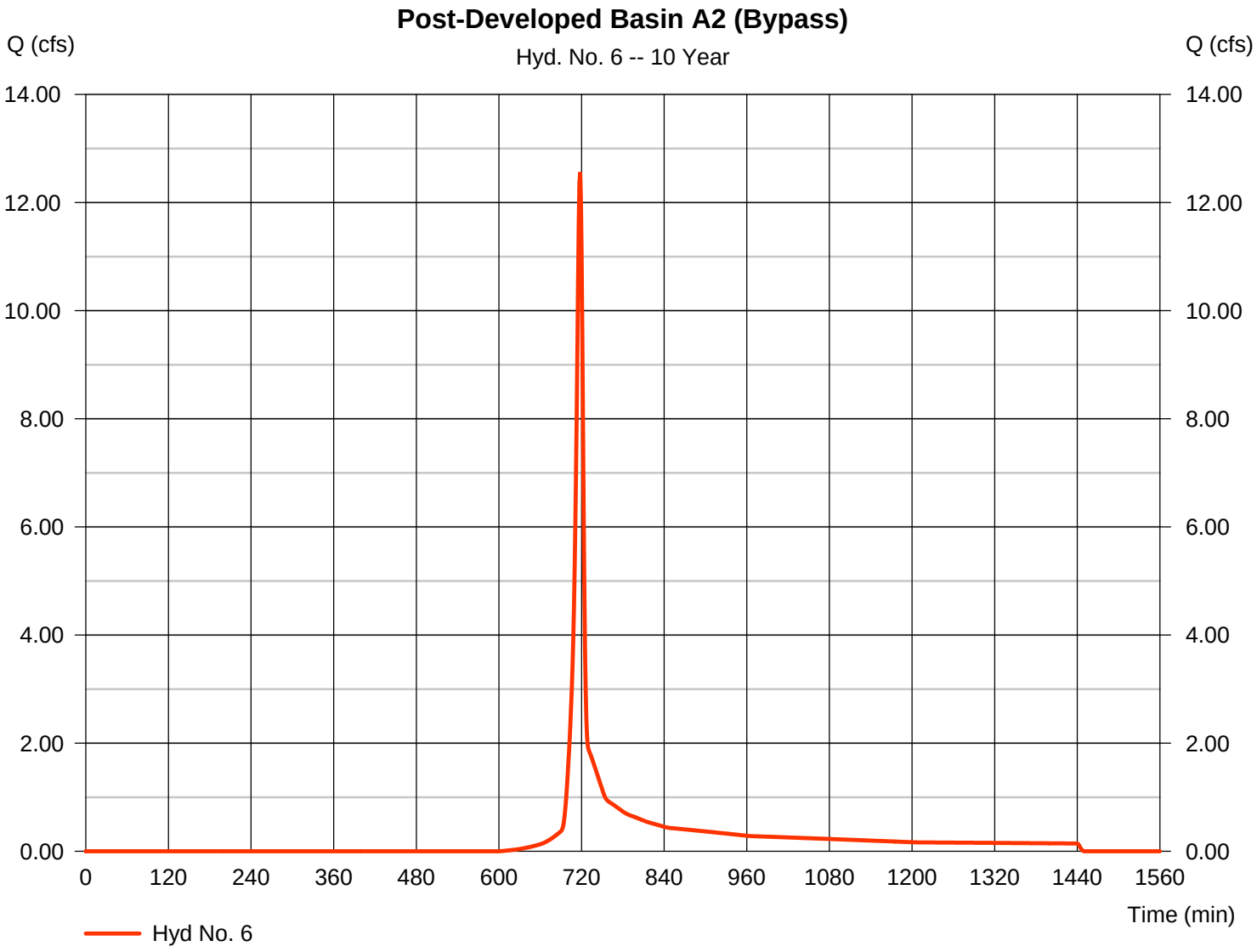
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 12.56 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 25,227 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



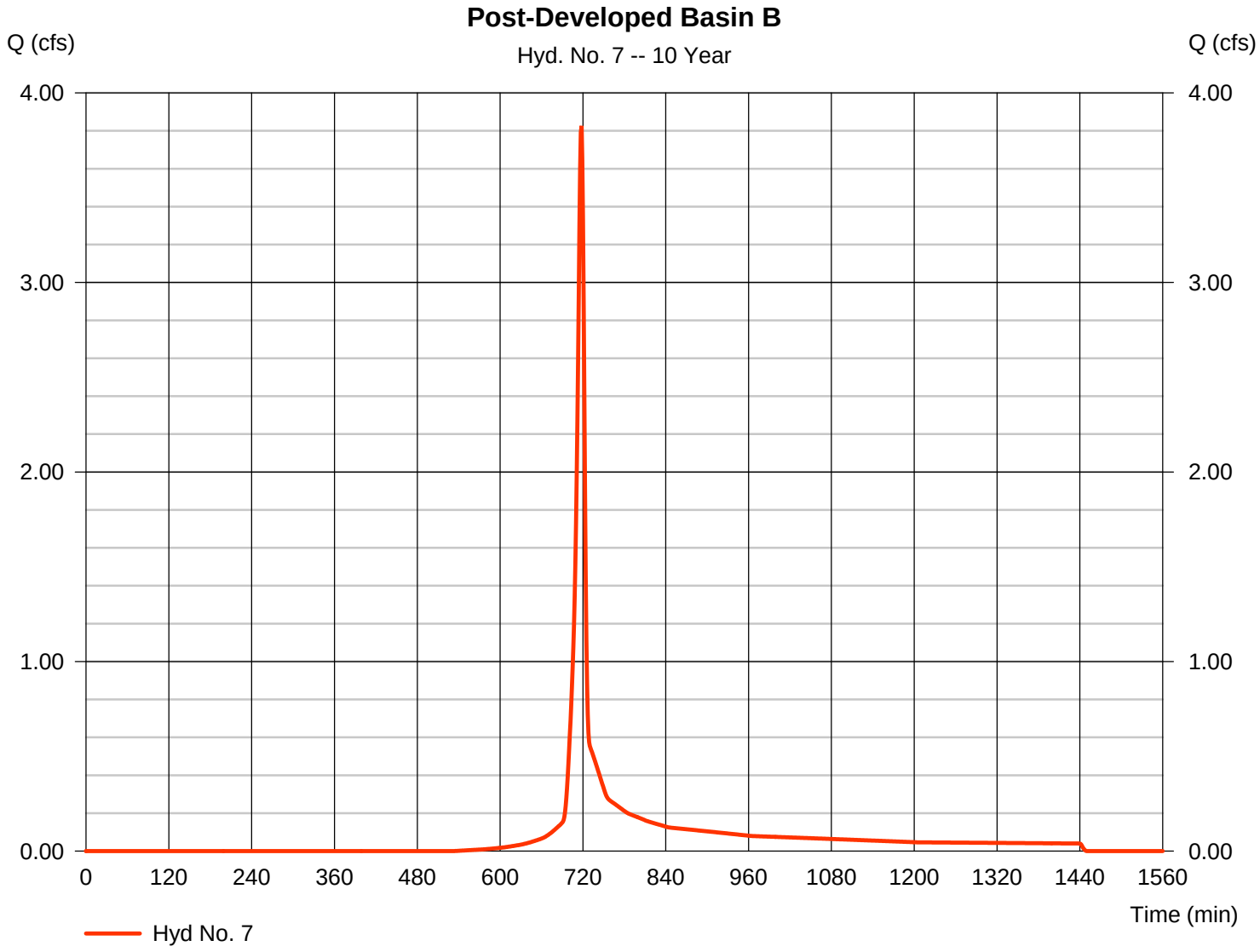
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.826 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	7,705 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	5.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



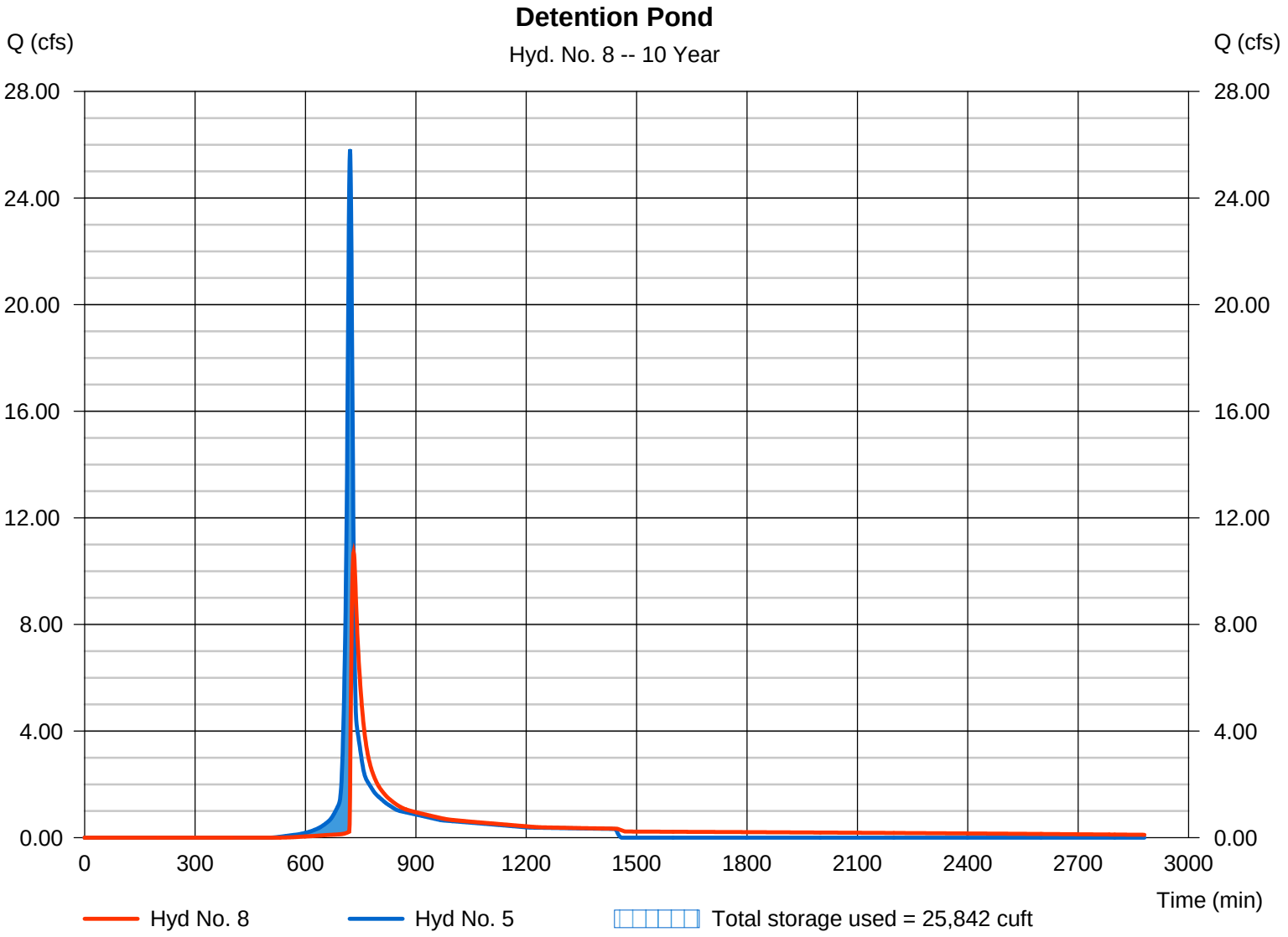
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	10.70 cfs
Storm frequency	=	10 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	63,489 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total)	Max. Elevation	=	1417.53 ft
Reservoir name	=	Detention Pond	Max. Storage	=	25,842 cuft

Storage Indication method used.

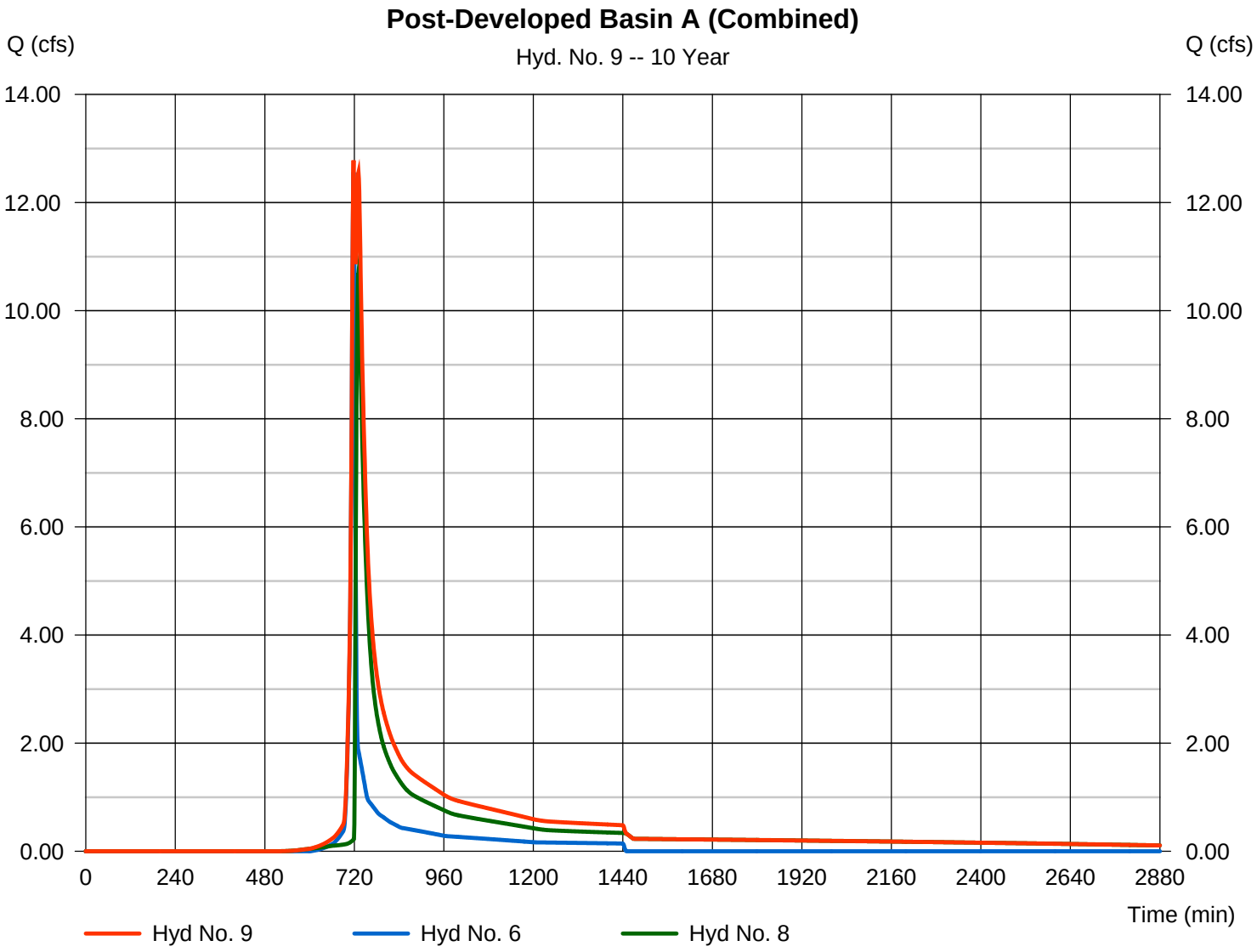


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	= Combine	Peak discharge	= 12.78 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 88,716 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 3.100 ac



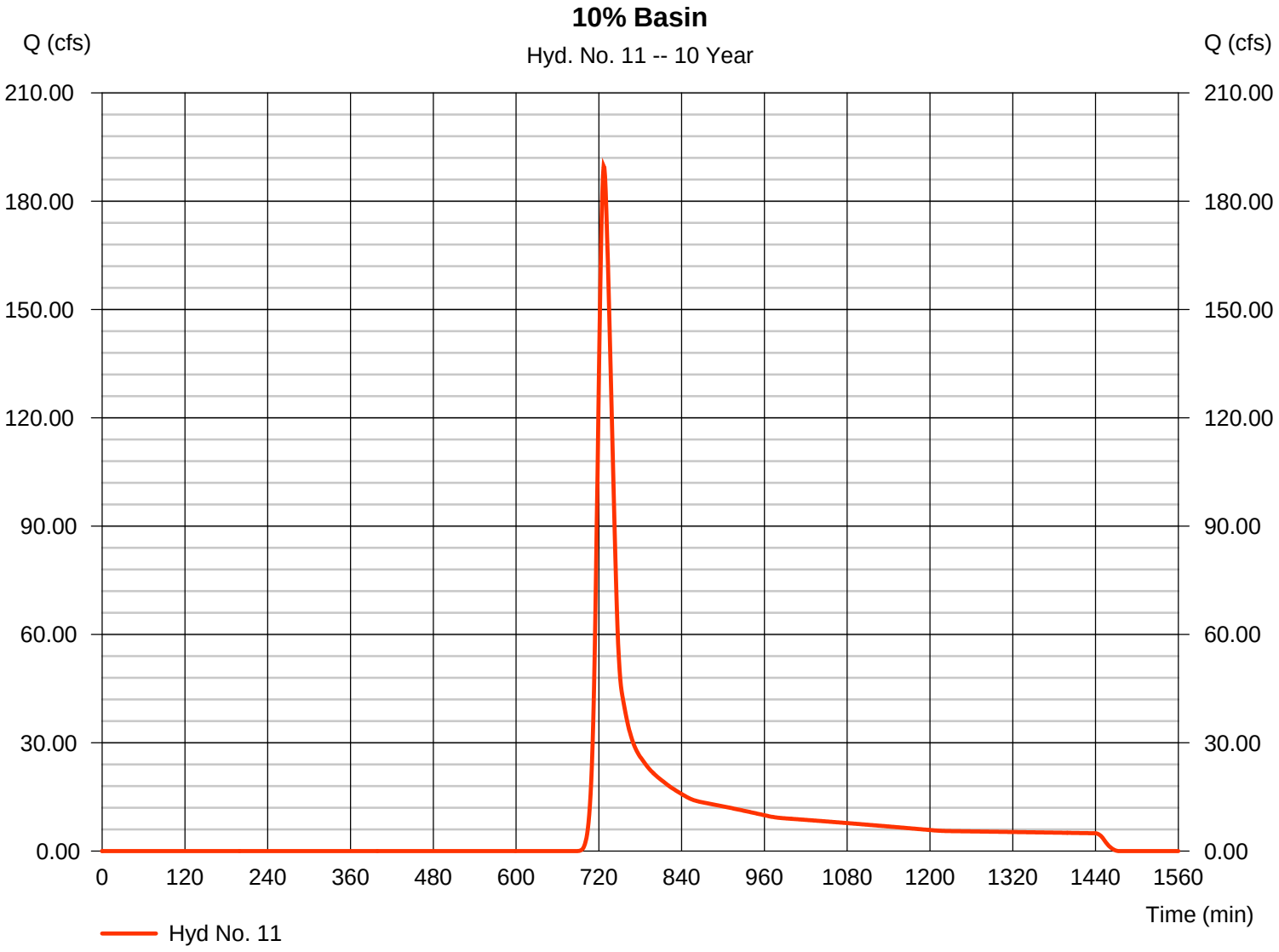
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	189.68 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	702,713 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	5.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700

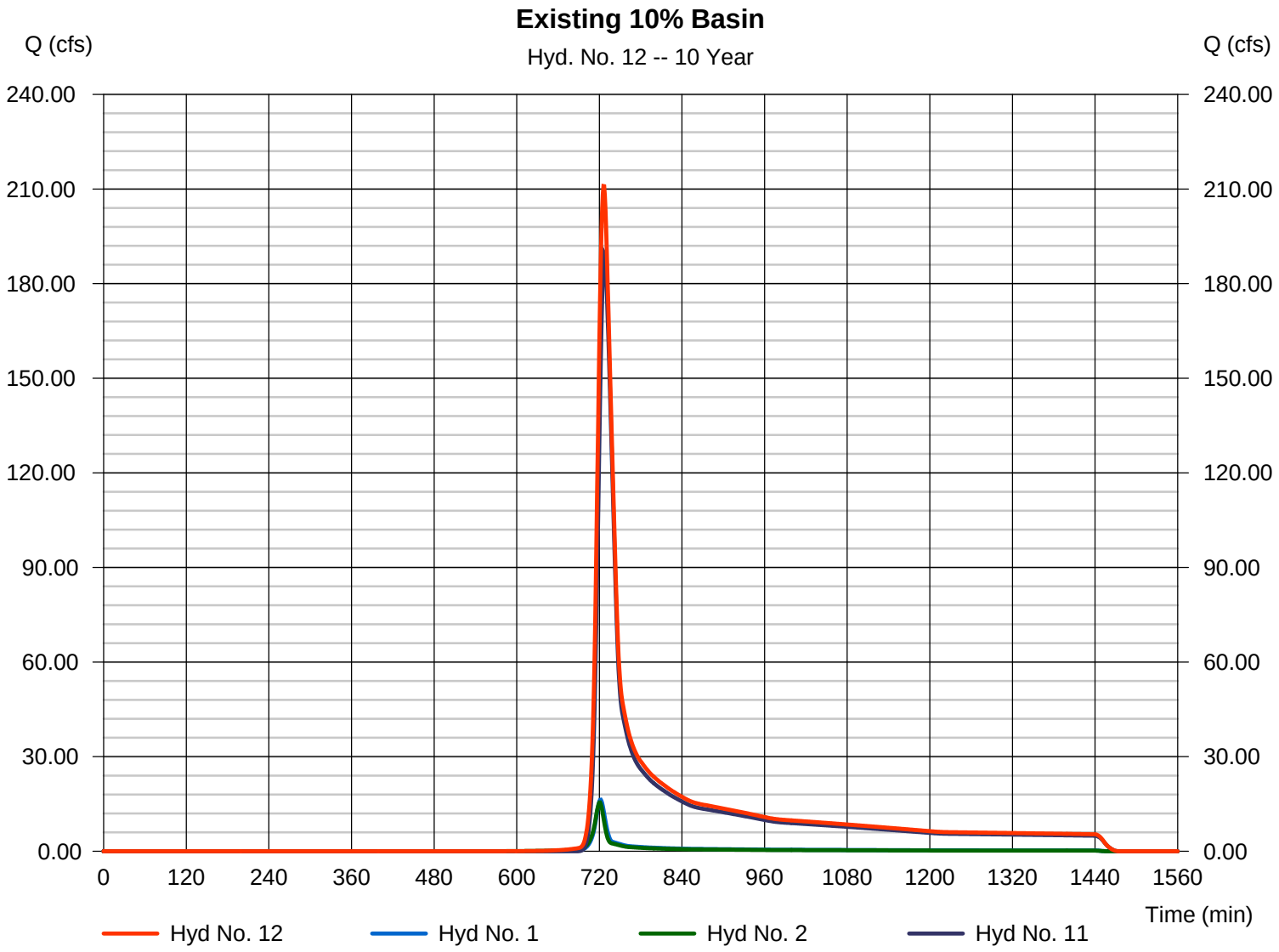


Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	210.92 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	782,465 cuft
Inflow hyds.	=	1, 2, 11	Contrib. drain. area	=	148.010 ac

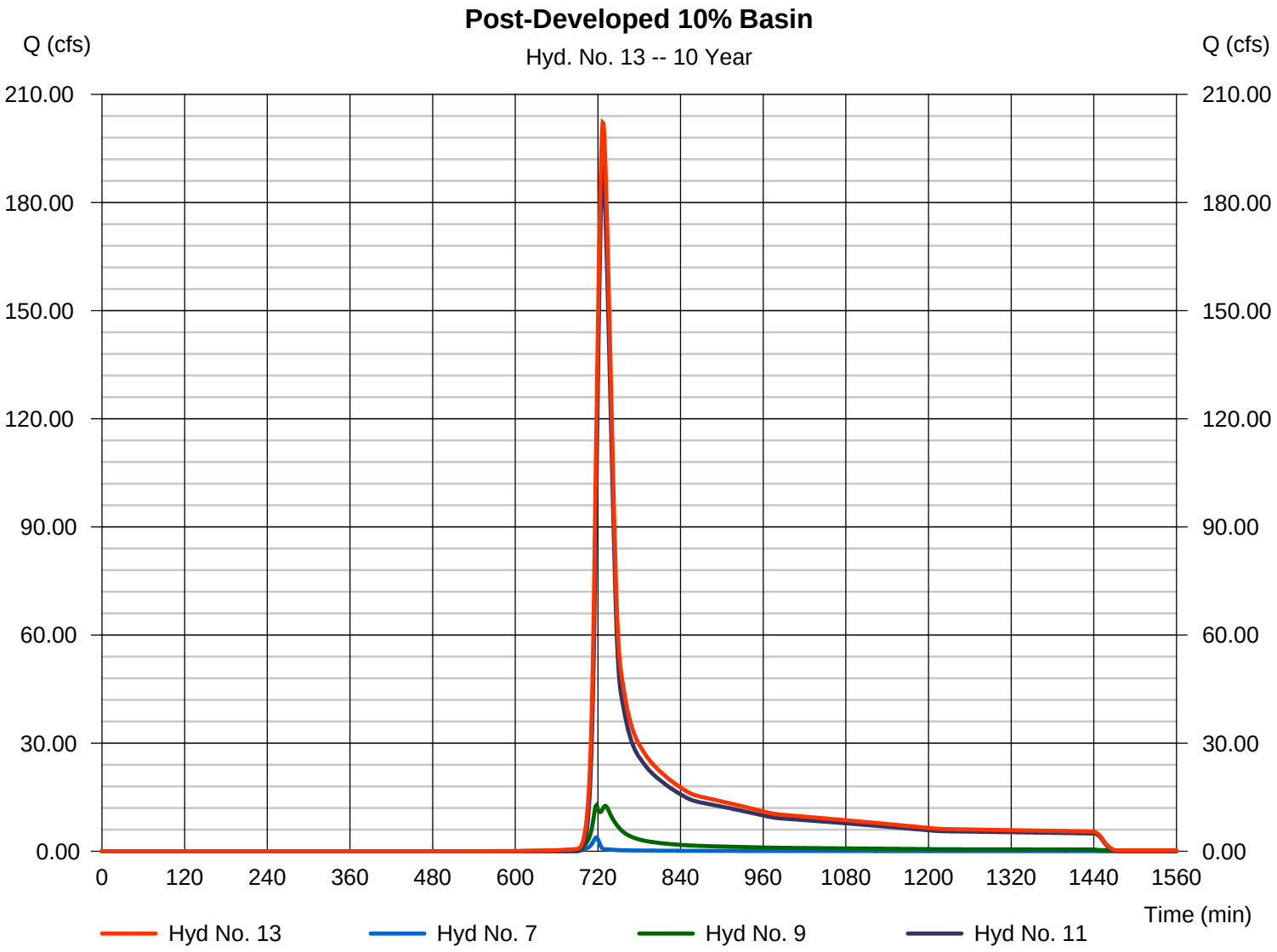


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	= Combine	Peak discharge	= 202.14 cfs
Storm frequency	= 10 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 799,135 cuft
Inflow hyds.	= 7, 9, 11	Contrib. drain. area	= 138.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	22.44	1	721	57,206	------	------	------	Pre-Developed Basin A
2	SCS Runoff	20.38	1	720	49,280	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.426	1	718	877	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	33.23	1	721	84,082	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	16.73	1	718	33,626	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	4.947	1	718	10,026	------	------	------	Post-Developed Basin B
8	Reservoir	18.30	1	729	82,316	5	1418.26	30,448	Detention Pond
9	Combine	21.86	1	721	115,942	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	283.52	1	727	996,530	------	------	------	10% Basin
12	Combine	312.93	1	726	1,103,017	1, 2, 11	------	------	Existing 10% Basin
13	Combine	305.49	1	727	1,122,498	7, 9, 11,	------	------	Post-Developed 10% Basin

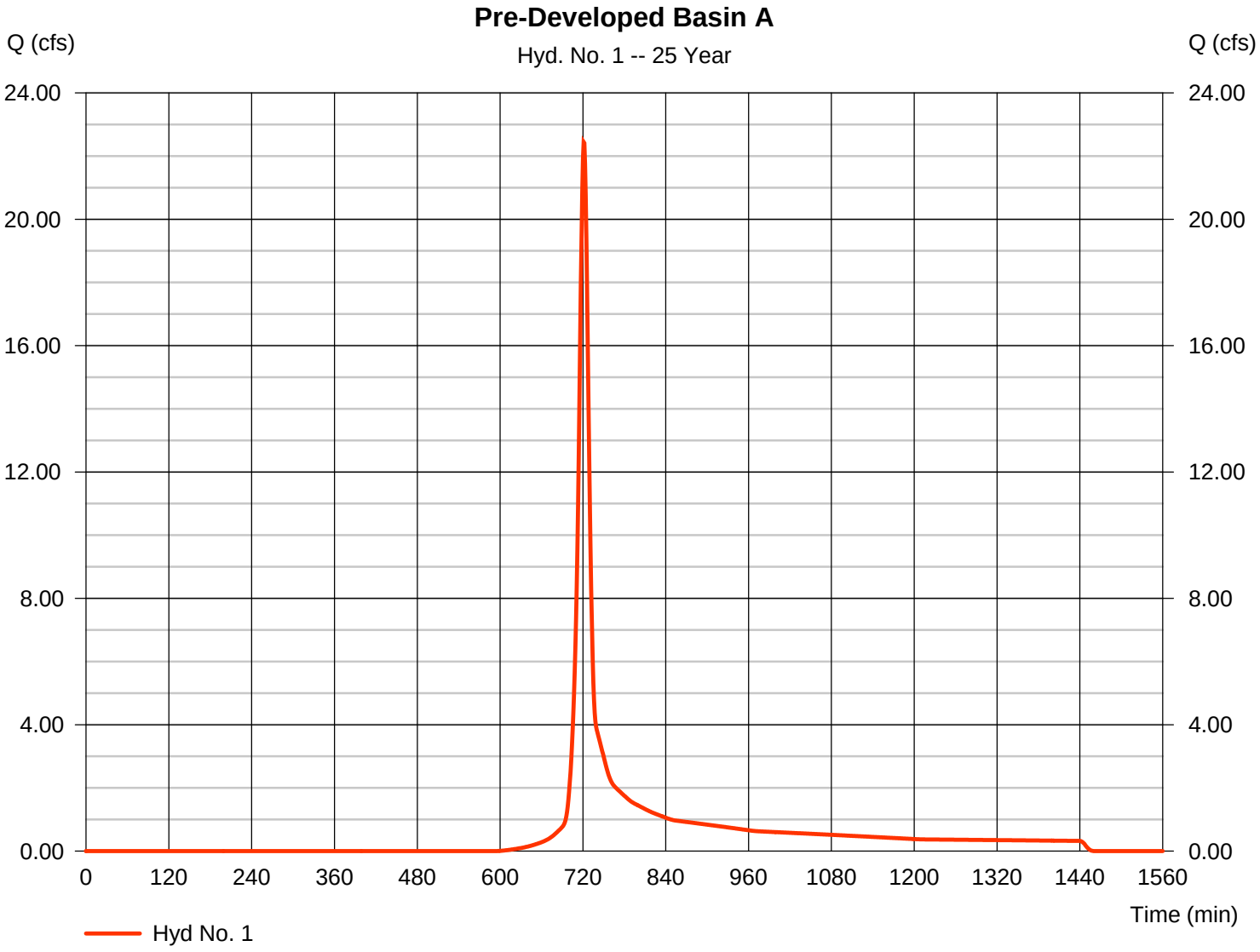
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.44 cfs
Storm frequency	=	25 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	57,206 cuft
Drainage area	=	6.130 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.40 min
Total precip.	=	6.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



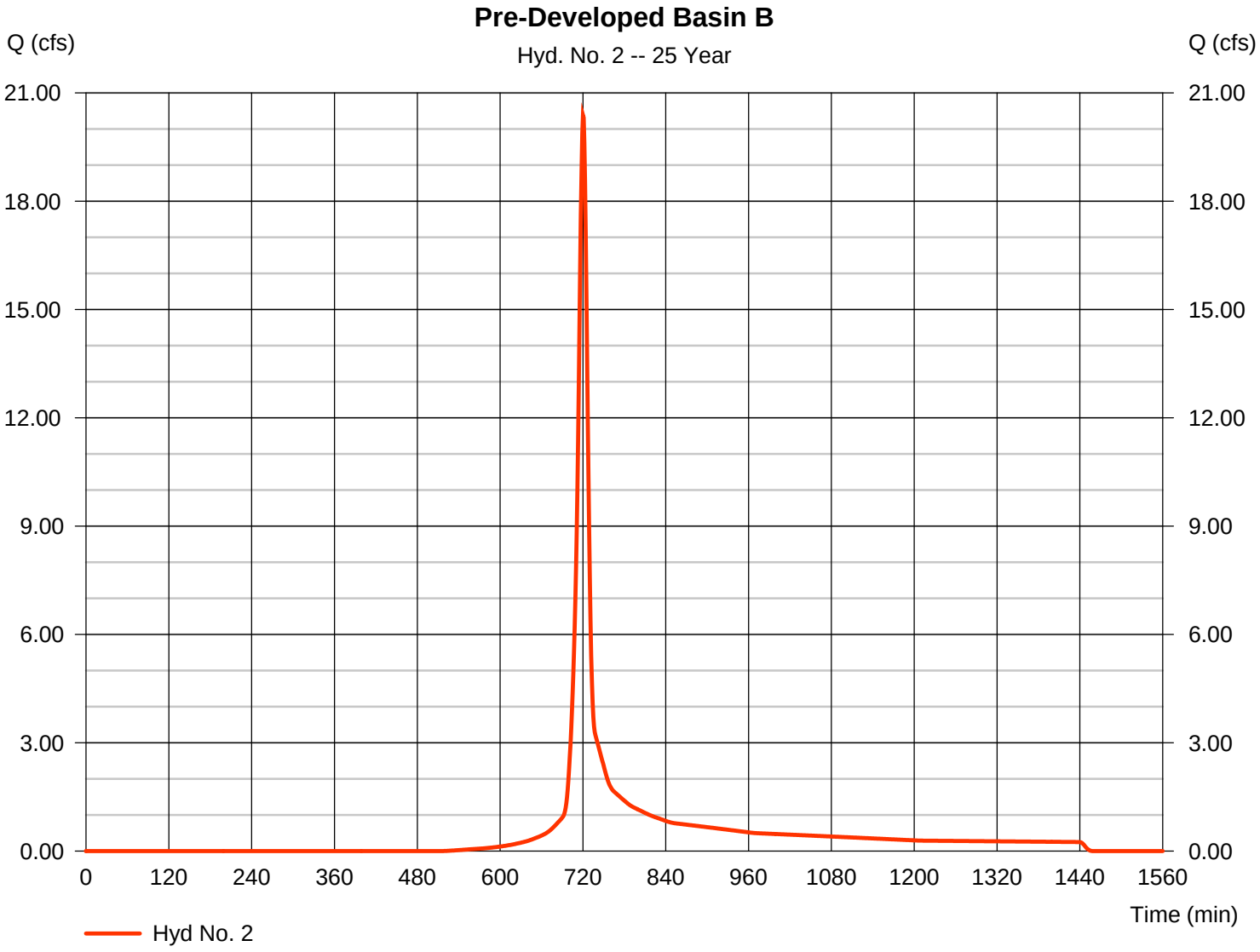
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.38 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	49,280 cuft
Drainage area	=	4.180 ac	Curve number	=	70*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	6.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180

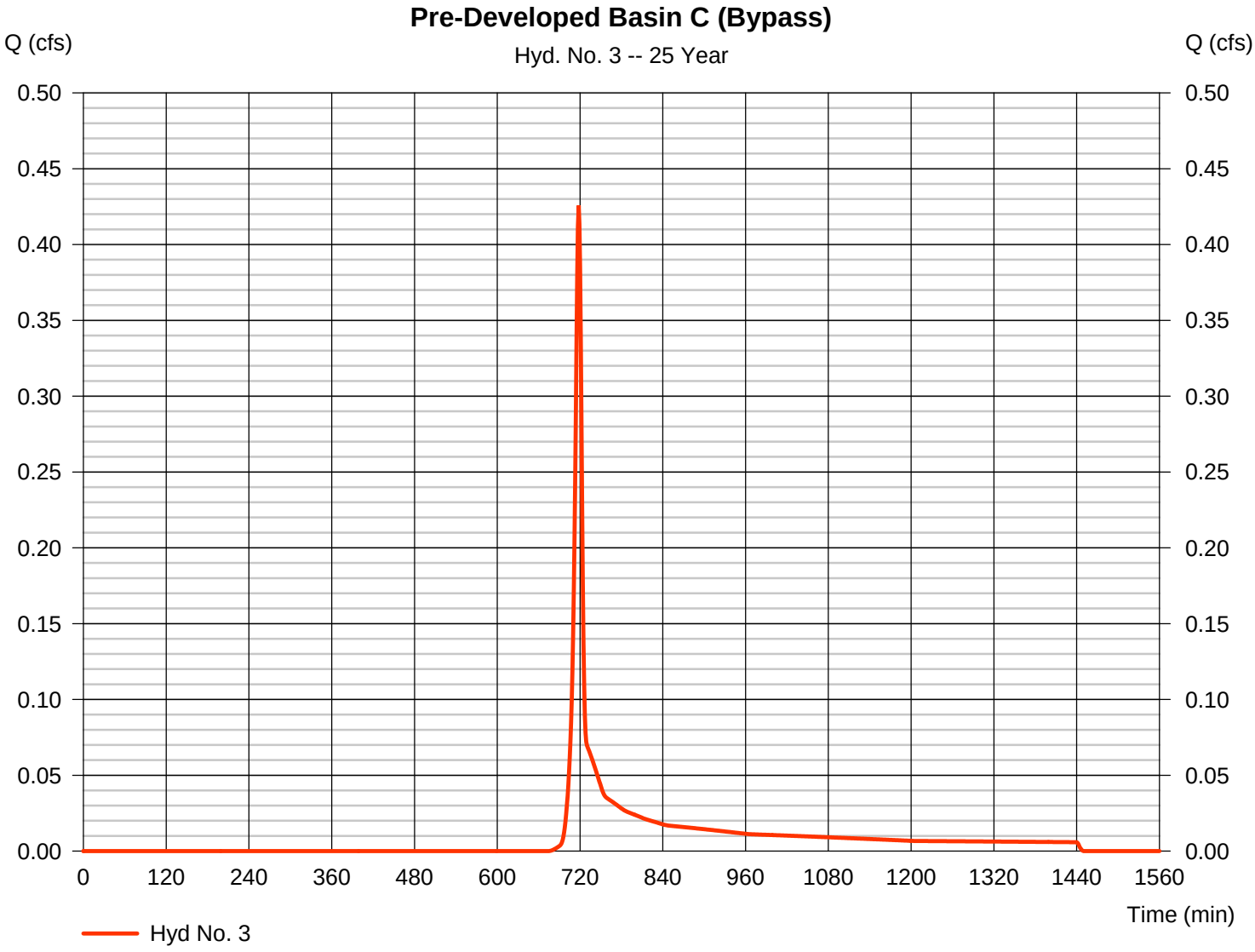


Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.426 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 877 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



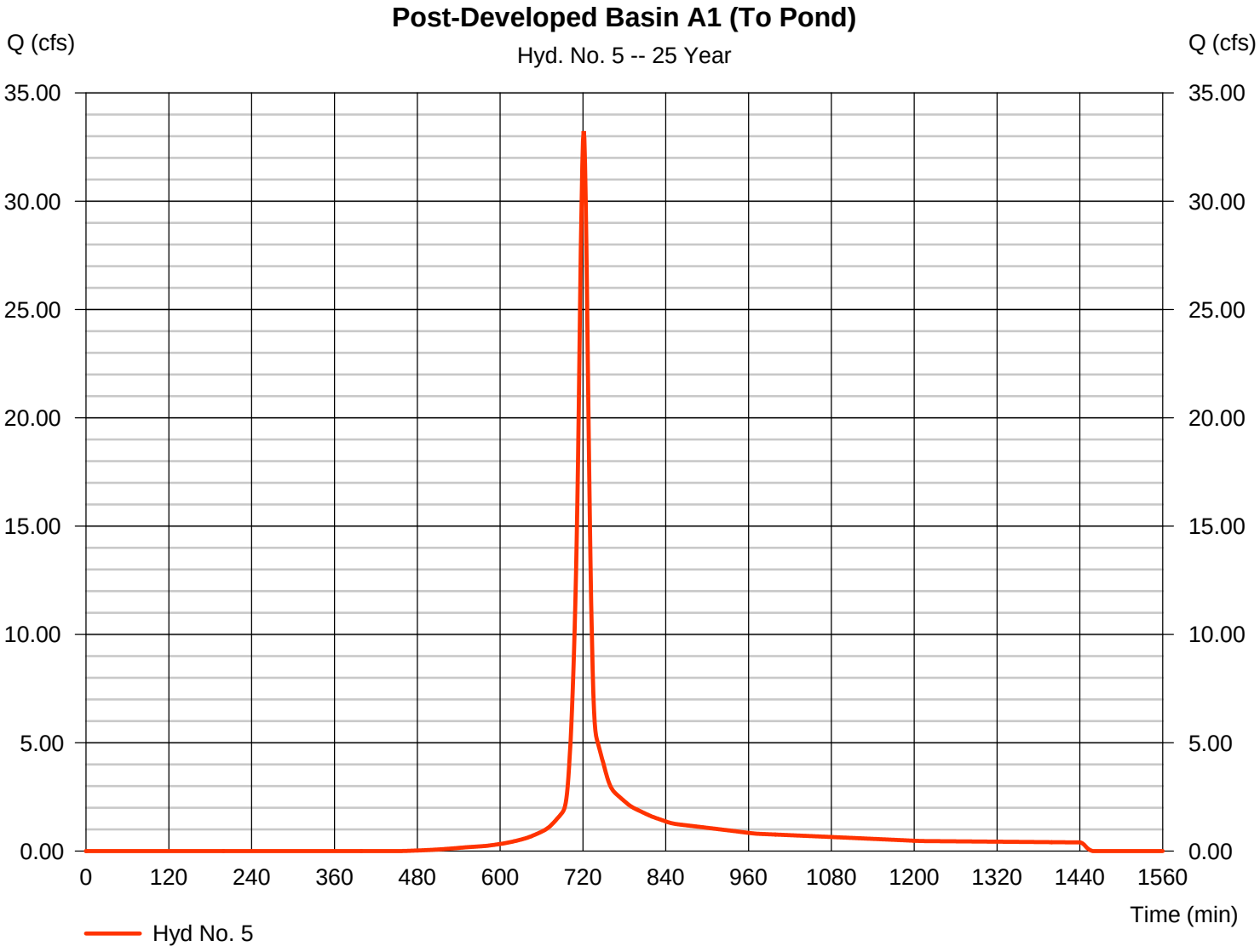
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	= SCS Runoff	Peak discharge	= 33.23 cfs
Storm frequency	= 25 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 84,082 cuft
Drainage area	= 6.550 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



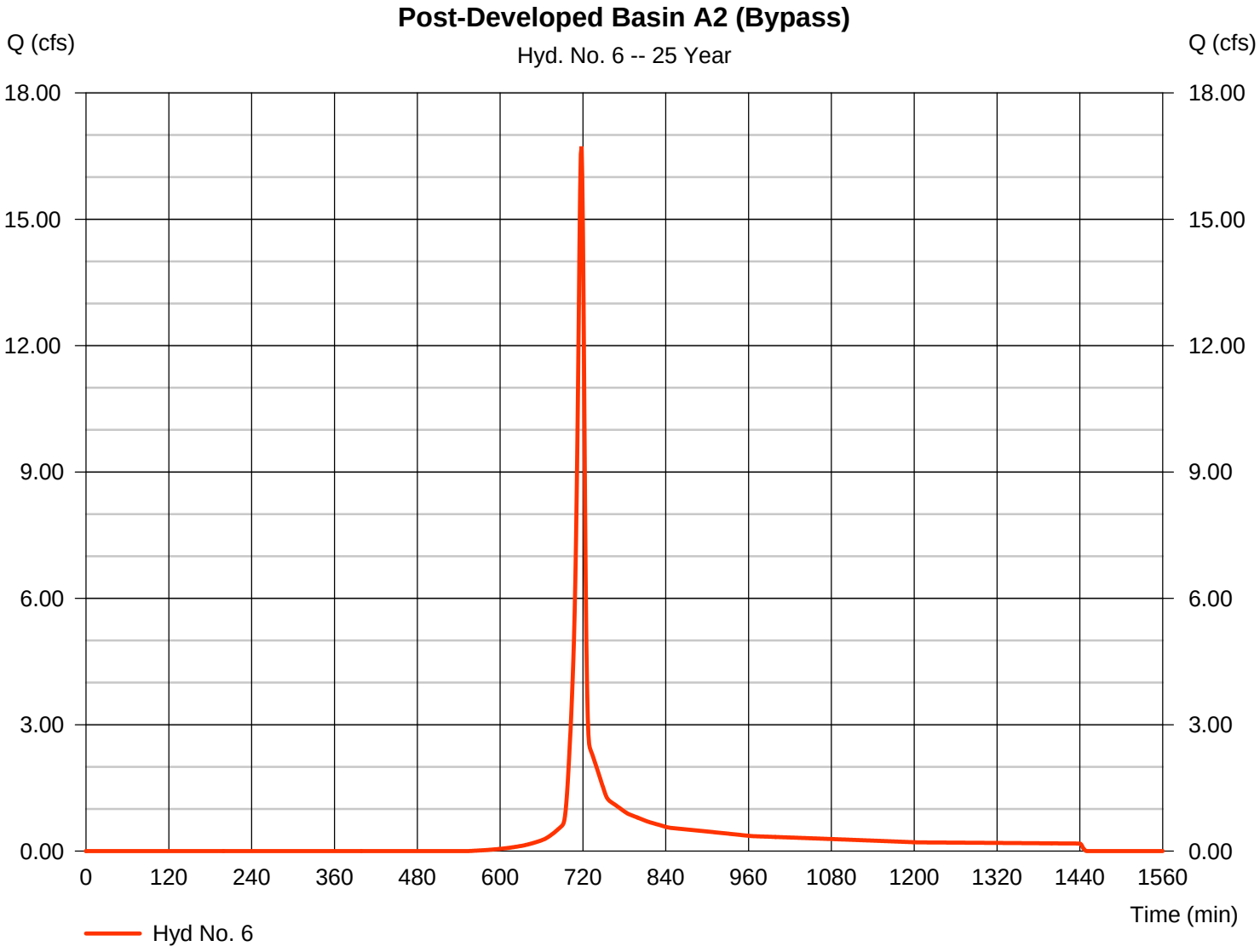
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 16.73 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 33,626 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



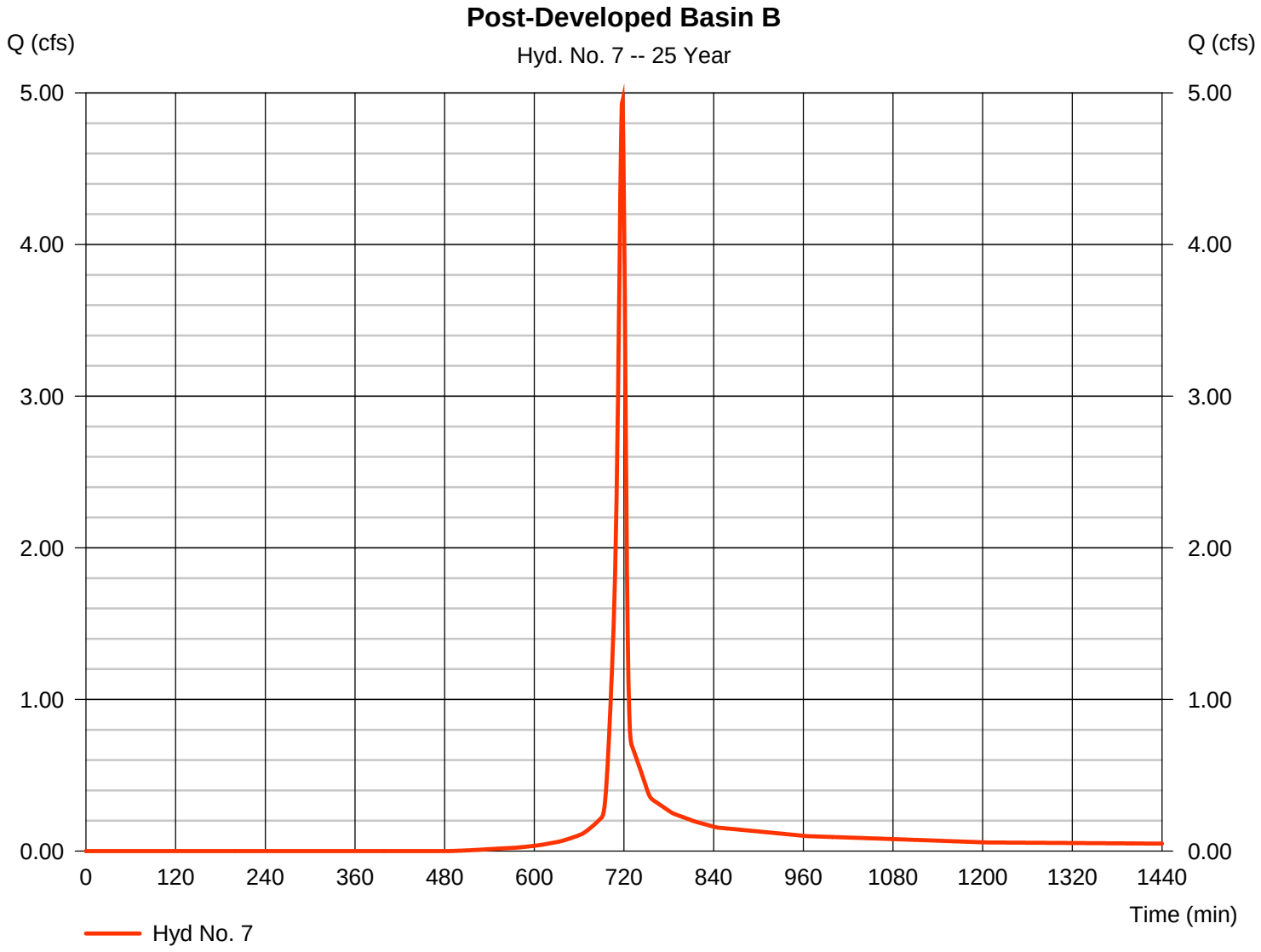
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.947 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	10,026 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	6.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



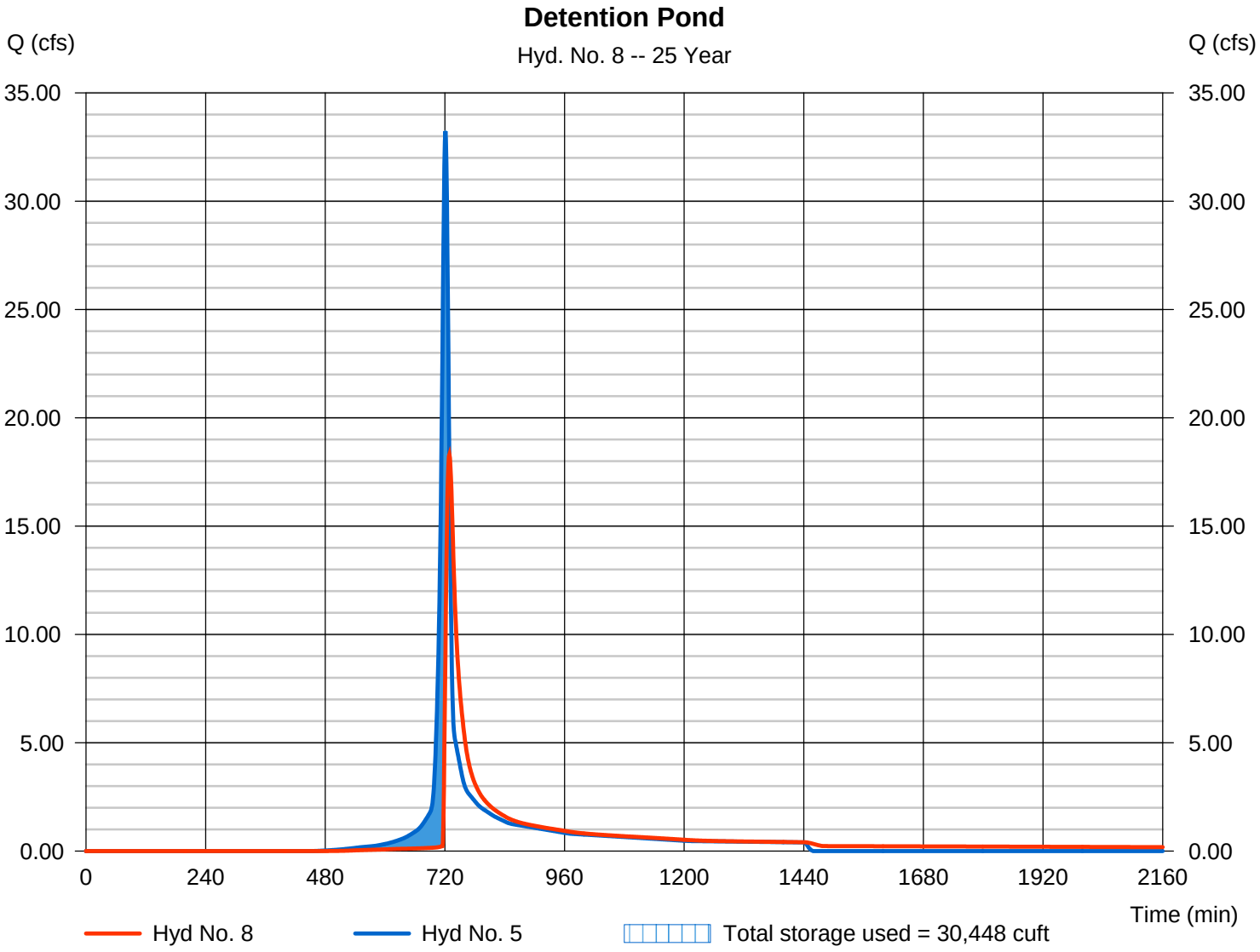
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	18.30 cfs
Storm frequency	=	25 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	82,316 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total)	Max. Elevation	=	1418.26 ft
Reservoir name	=	Detention Pond	Max. Storage	=	30,448 cuft

Storage Indication method used.

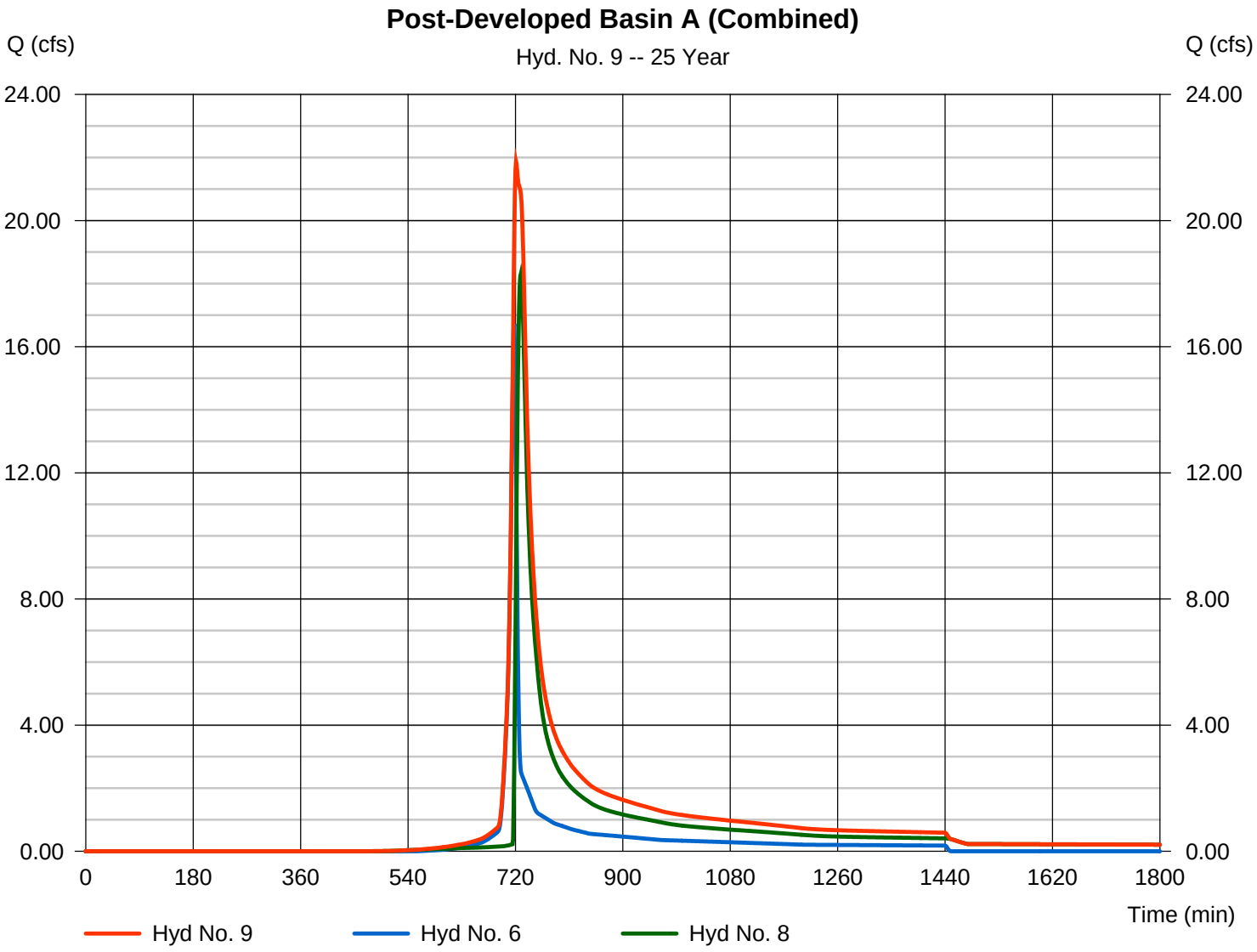


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	=	Combine	Peak discharge	=	21.86 cfs
Storm frequency	=	25 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	115,942 cuft
Inflow hyds.	=	6, 8	Contrib. drain. area	=	3.100 ac



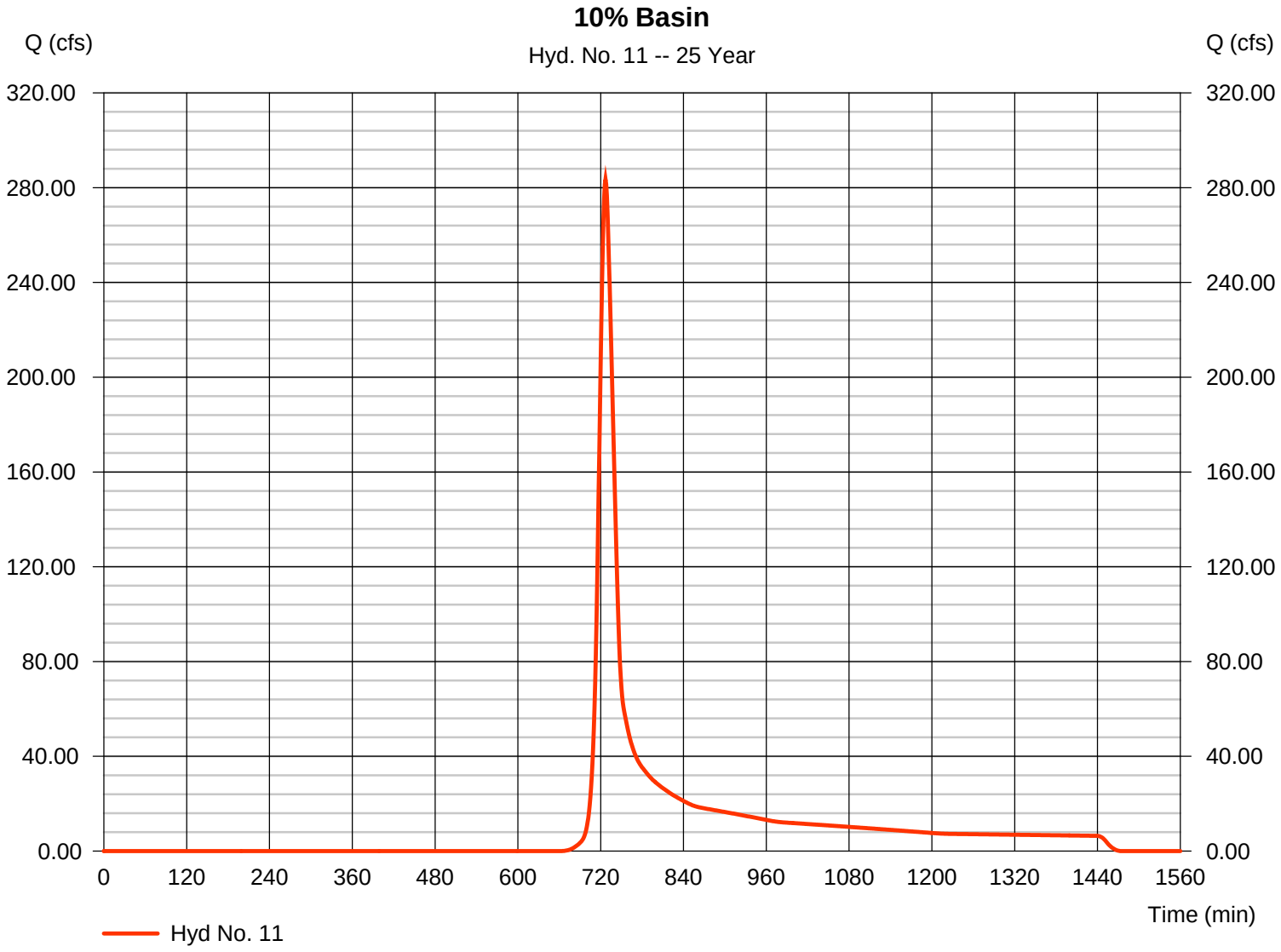
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	283.52 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	996,530 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	6.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700

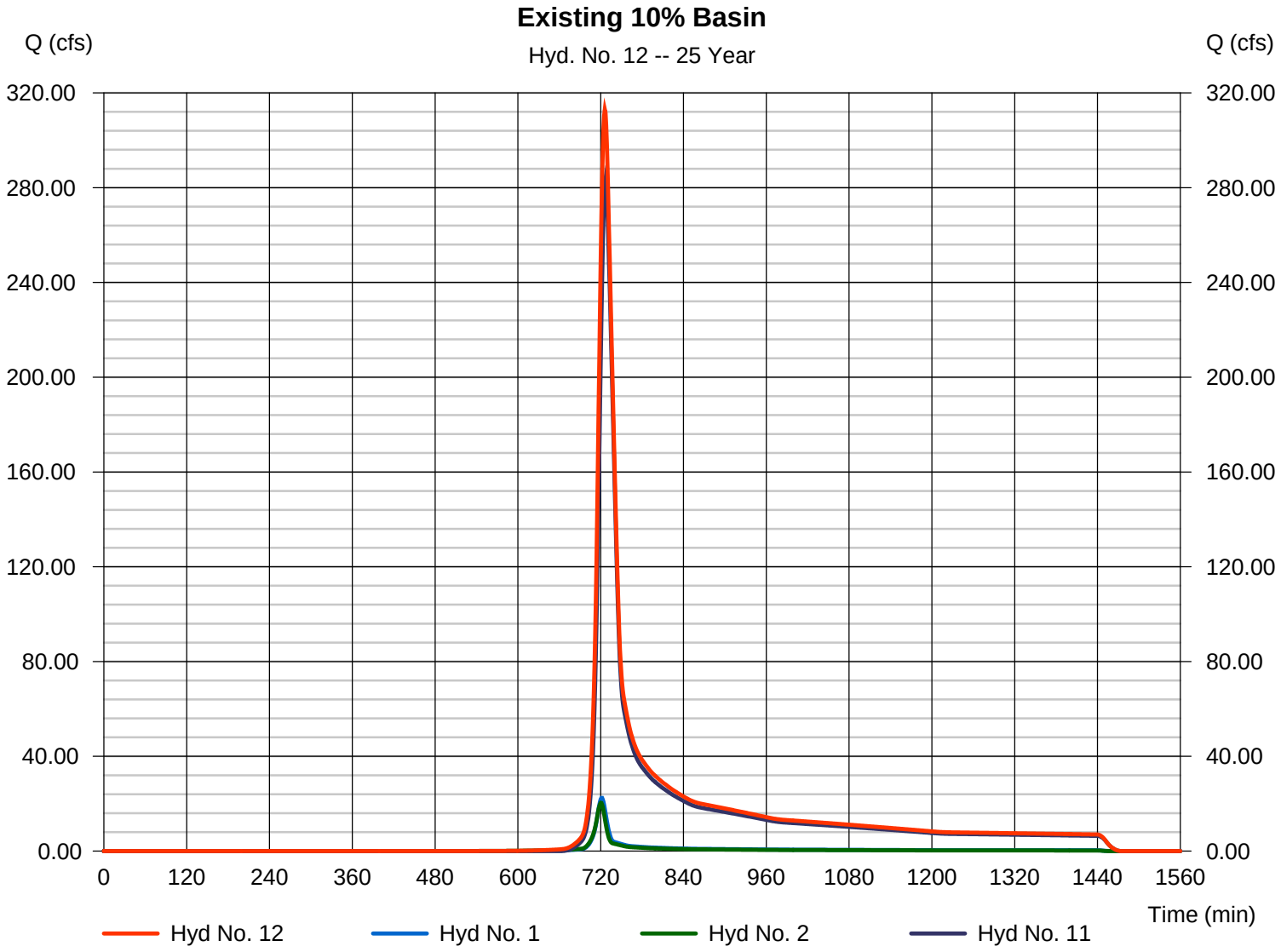


Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	312.93 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	1,103,017 cuft
Inflow hyds.	=	1, 2, 11	Contrib. drain. area	=	148.010 ac

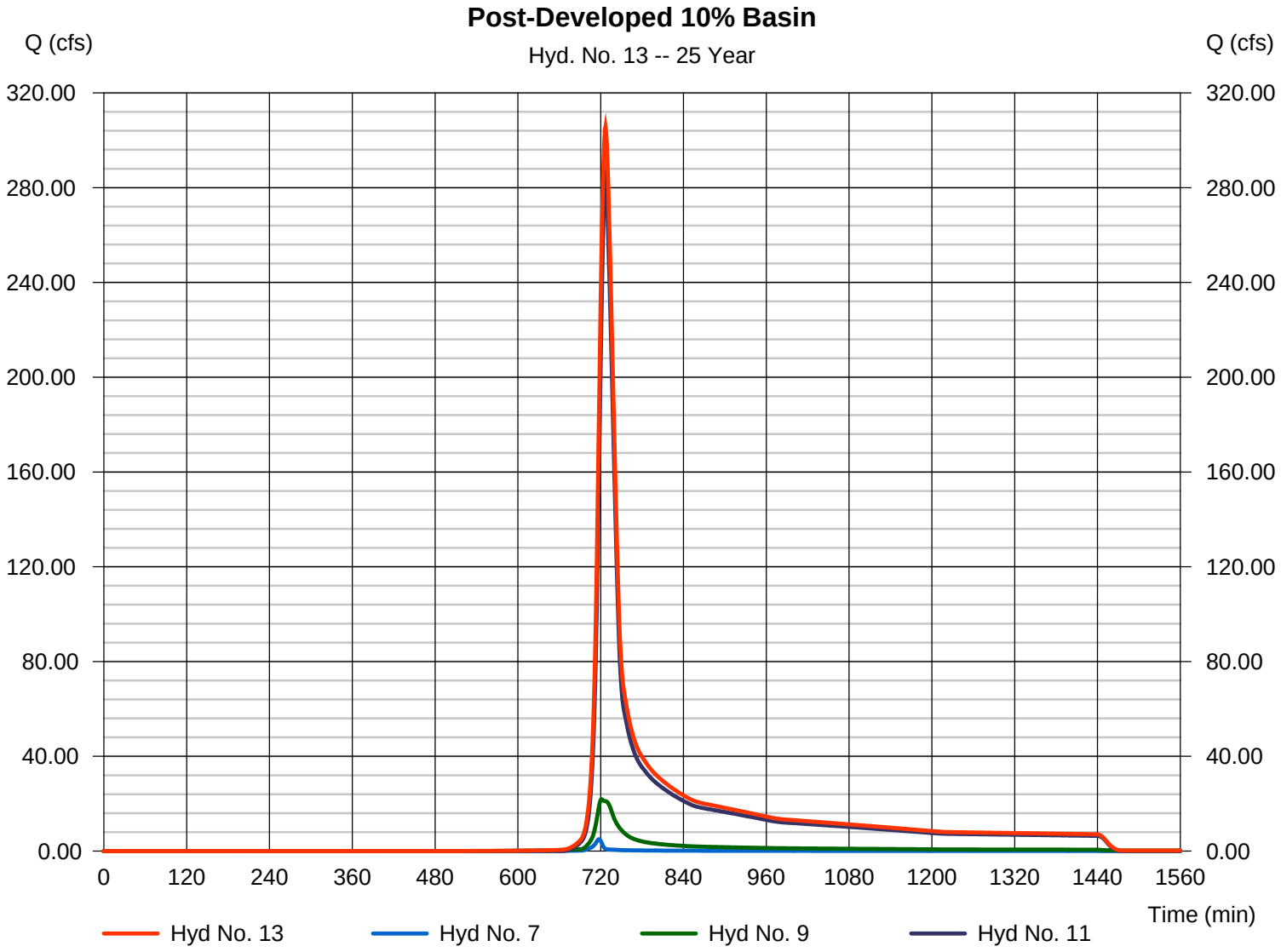


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	305.49 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	1,122,498 cuft
Inflow hyds.	=	7, 9, 11	Contrib. drain. area	=	138.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	32.21	1	721	81,430	------	------	------	Pre-Developed Basin A
2	SCS Runoff	28.02	1	720	67,887	------	------	------	Pre-Developed Basin B
3	SCS Runoff	0.658	1	718	1,328	------	------	------	Pre-Developed Basin C (Bypass)
5	SCS Runoff	44.62	1	721	113,612	------	------	------	Post-Developed Basin A1 (To Pond)
6	SCS Runoff	23.26	1	718	47,057	------	------	------	Post-Developed Basin A2 (Bypass)
7	SCS Runoff	6.670	1	718	13,676	------	------	------	Post-Developed Basin B
8	Reservoir	36.92	1	725	111,796	5	1418.89	34,801	Detention Pond
9	Combine	44.65	1	724	158,853	6, 8	------	------	Post-Developed Basin A (Combined)
11	SCS Runoff	438.50	1	727	1,486,437	------	------	------	10% Basin
12	Combine	481.06	1	726	1,635,756	1, 2, 11	------	------	Existing 10% Basin
13	Combine	480.49	1	726	1,658,965	7, 9, 11,	------	------	Post-Developed 10% Basin

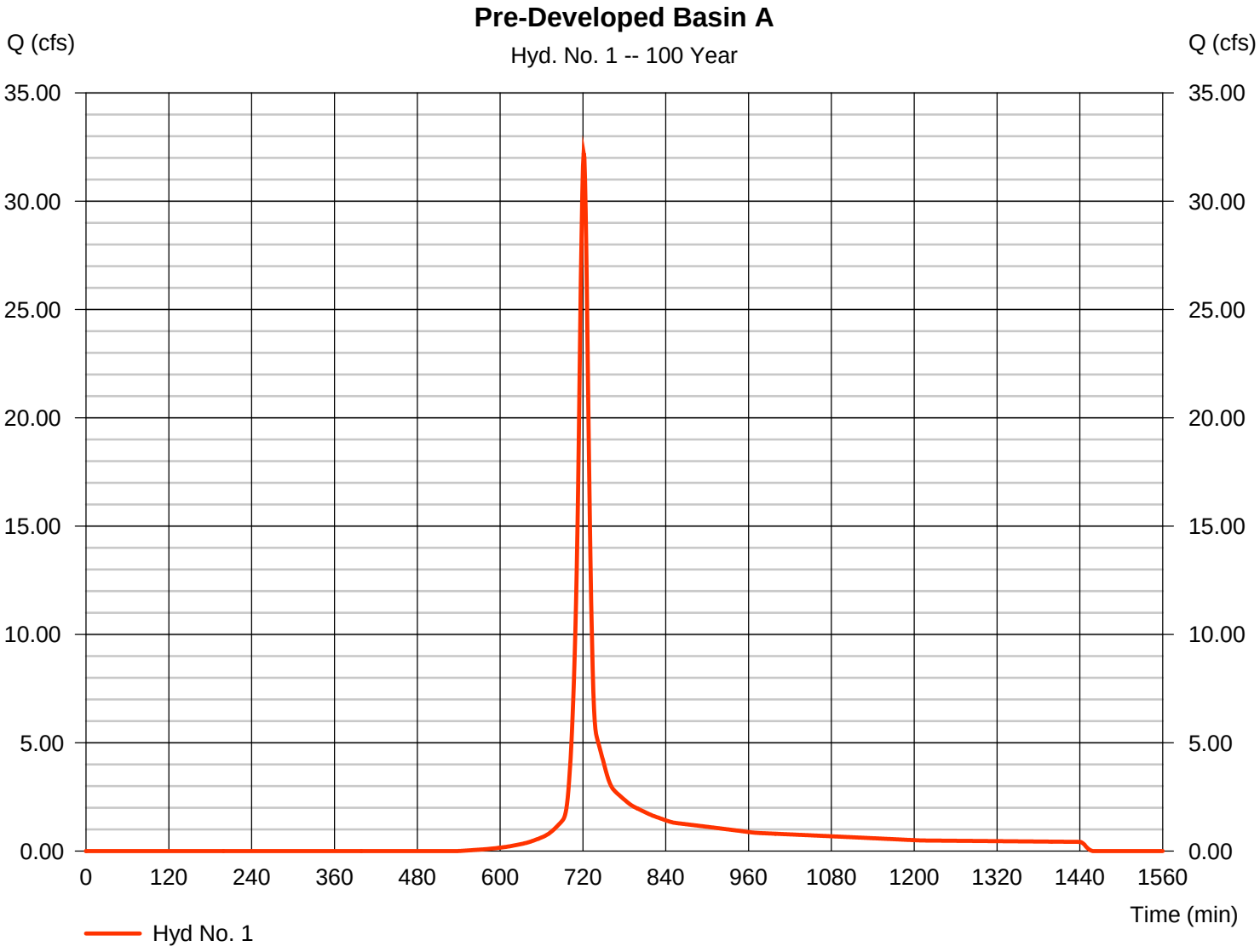
Hydrograph Report

Hyd. No. 1

Pre-Developed Basin A

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	81,430 cuft
Drainage area	=	6.130 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.40 min
Total precip.	=	7.92 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.870 x 98) + (1.700 x 61) + (3.360 x 55) + (0.110 x 85) + (0.090 x 85)] / 6.130



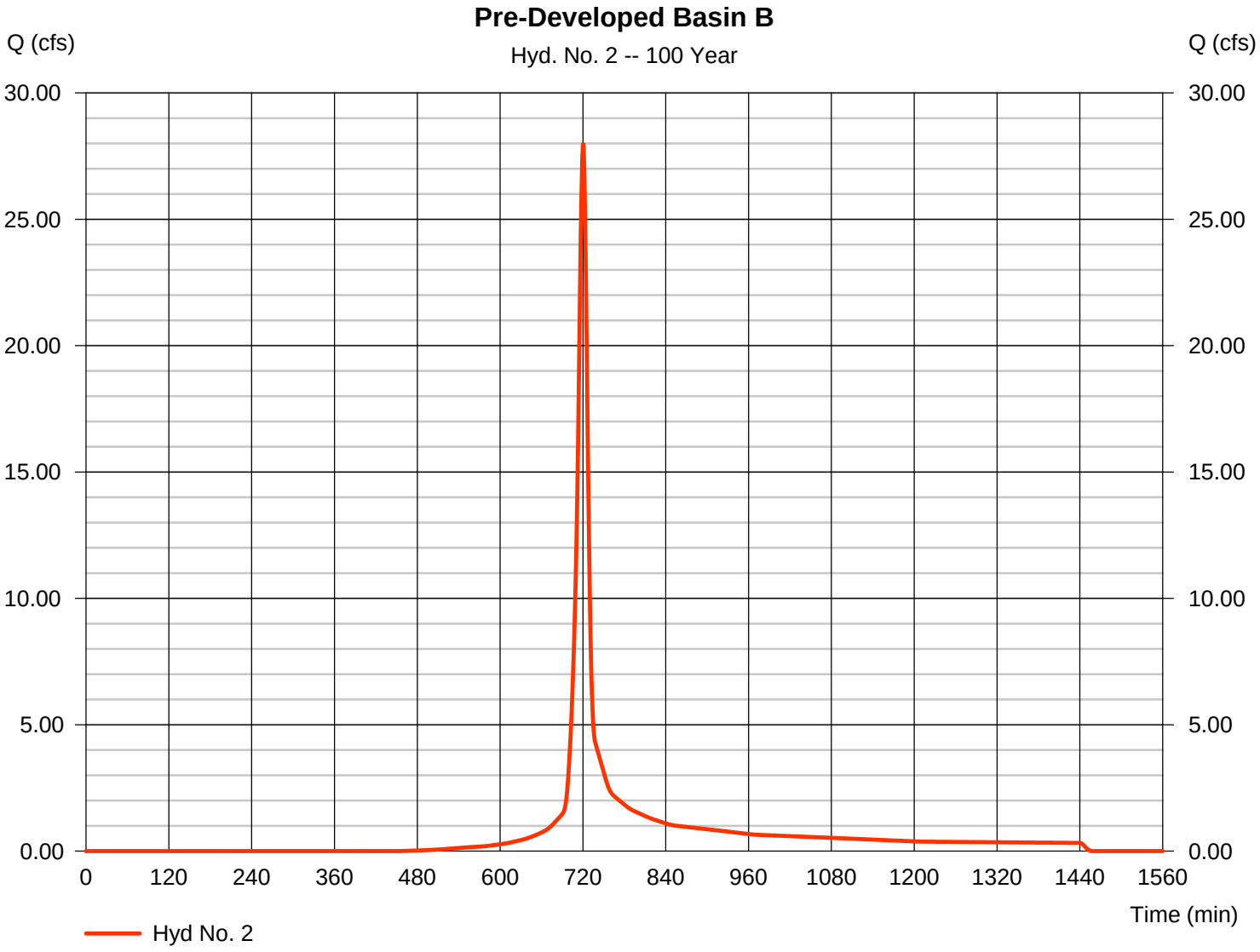
Hydrograph Report

Hyd. No. 2

Pre-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.02 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	67,887 cuft
Drainage area	=	4.180 ac	Curve number	=	70*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	7.92 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.140 x 98) + (2.310 x 61) + (0.730 x 55)] / 4.180

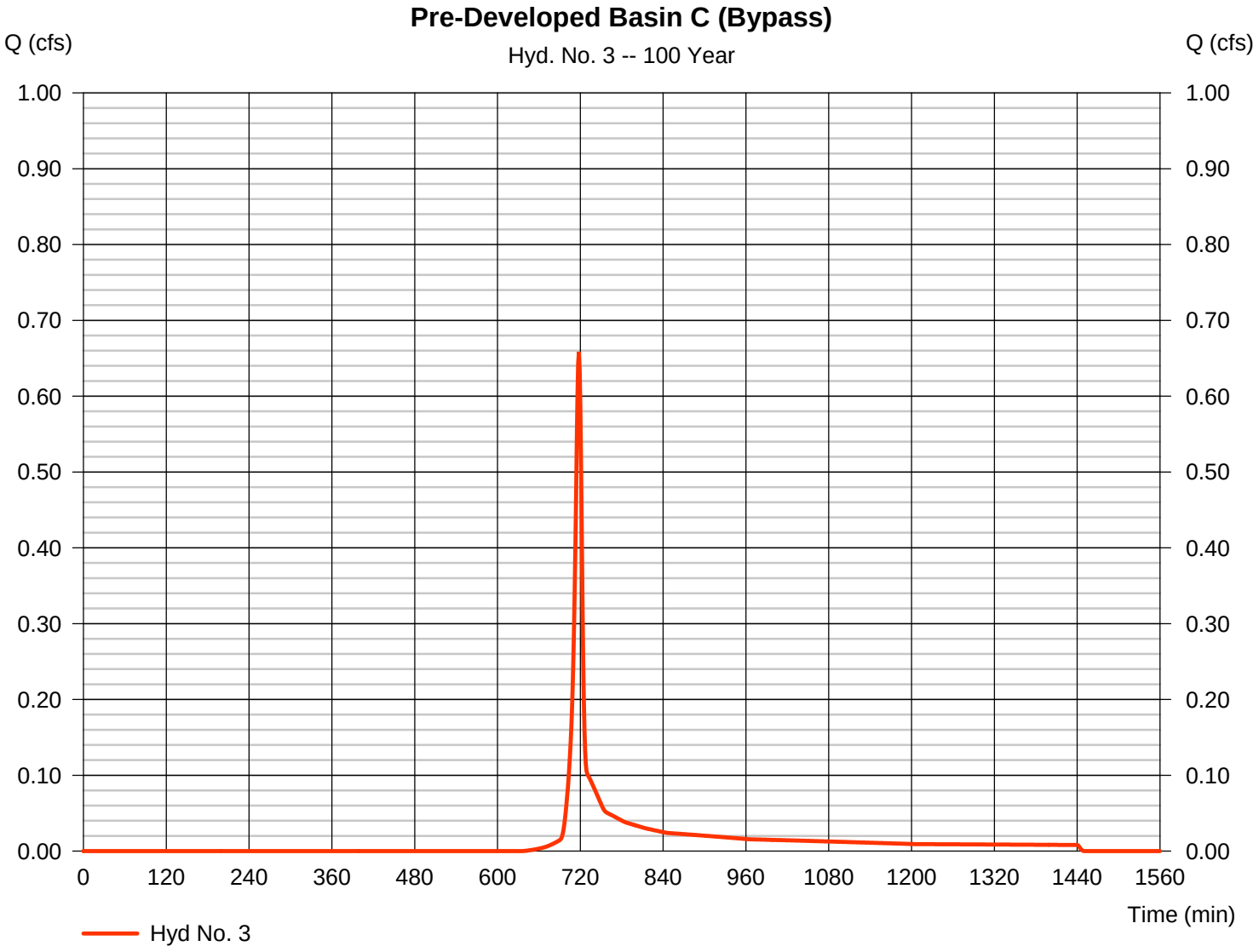


Hydrograph Report

Hyd. No. 3

Pre-Developed Basin C (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.658 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,328 cuft
Drainage area	= 0.130 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



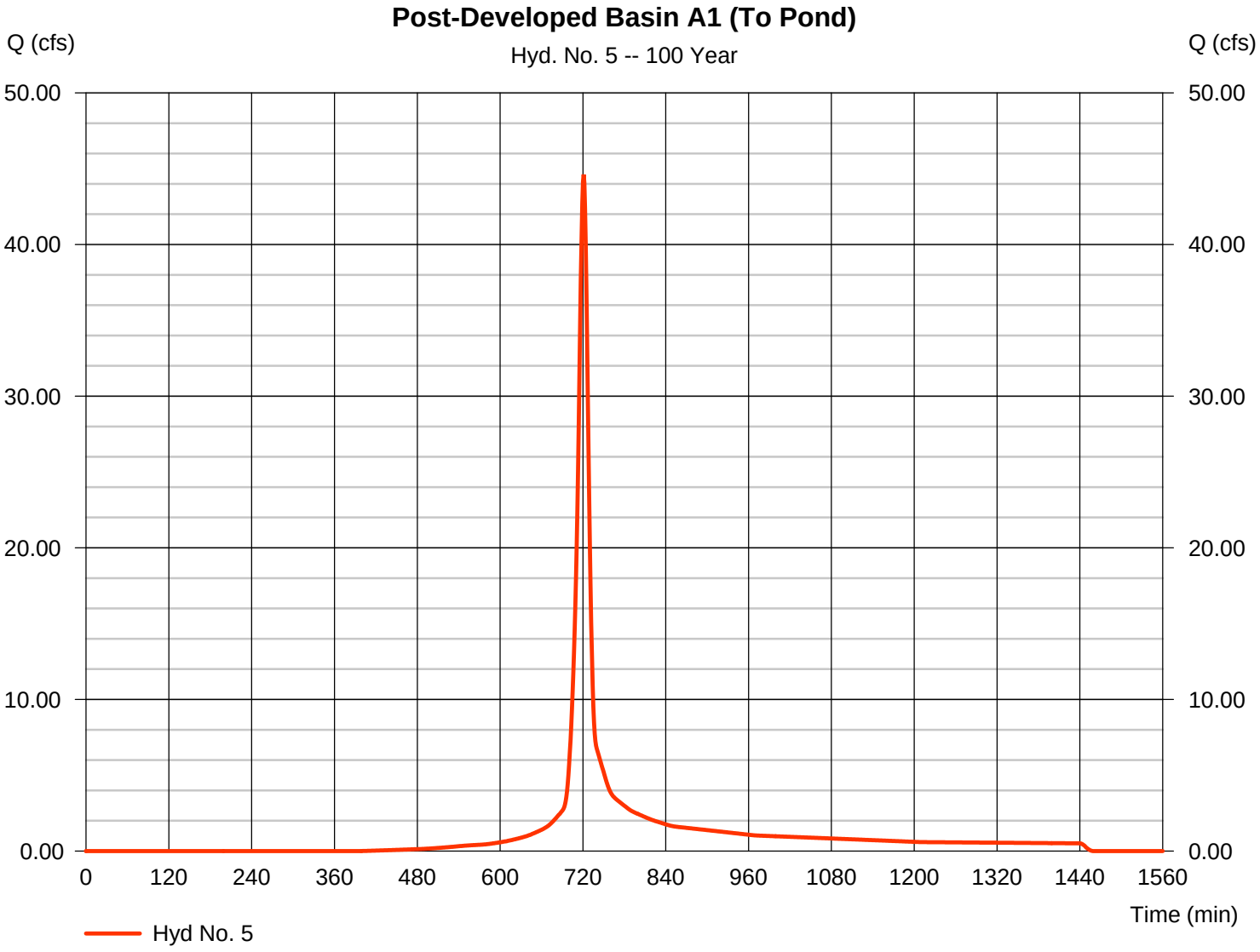
Hydrograph Report

Hyd. No. 5

Post-Developed Basin A1 (To Pond)

Hydrograph type	= SCS Runoff	Peak discharge	= 44.62 cfs
Storm frequency	= 100 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 113,612 cuft
Drainage area	= 6.550 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.290 x 98) + (4.160 x 61) + (0.020 x 85) + (0.080 x 79)] / 6.550



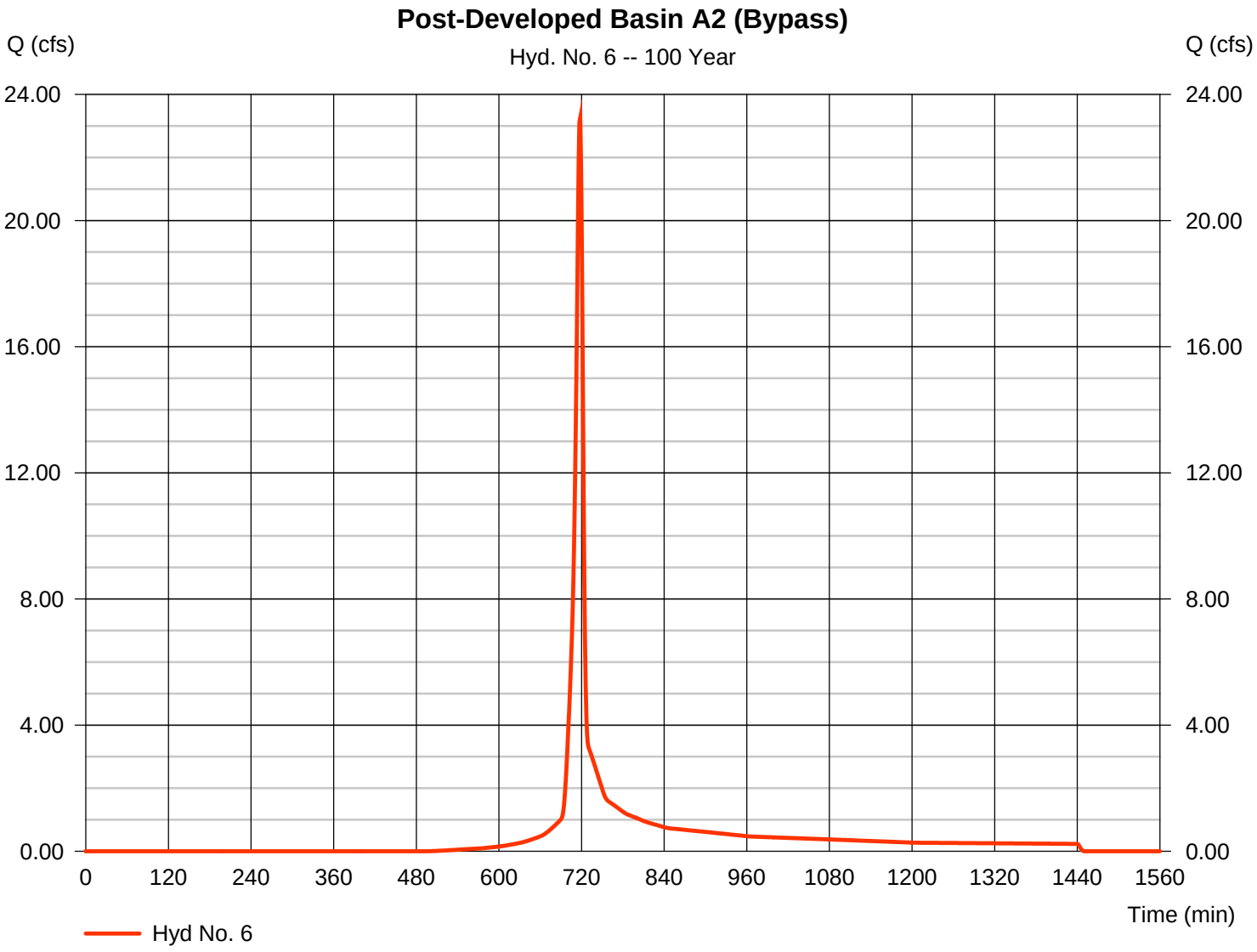
Hydrograph Report

Hyd. No. 6

Post-Developed Basin A2 (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 23.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 47,057 cuft
Drainage area	= 3.100 ac	Curve number	= 67*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 98) + (1.030 x 61) + (1.320 x 55) + (0.120 x 85)] / 3.100



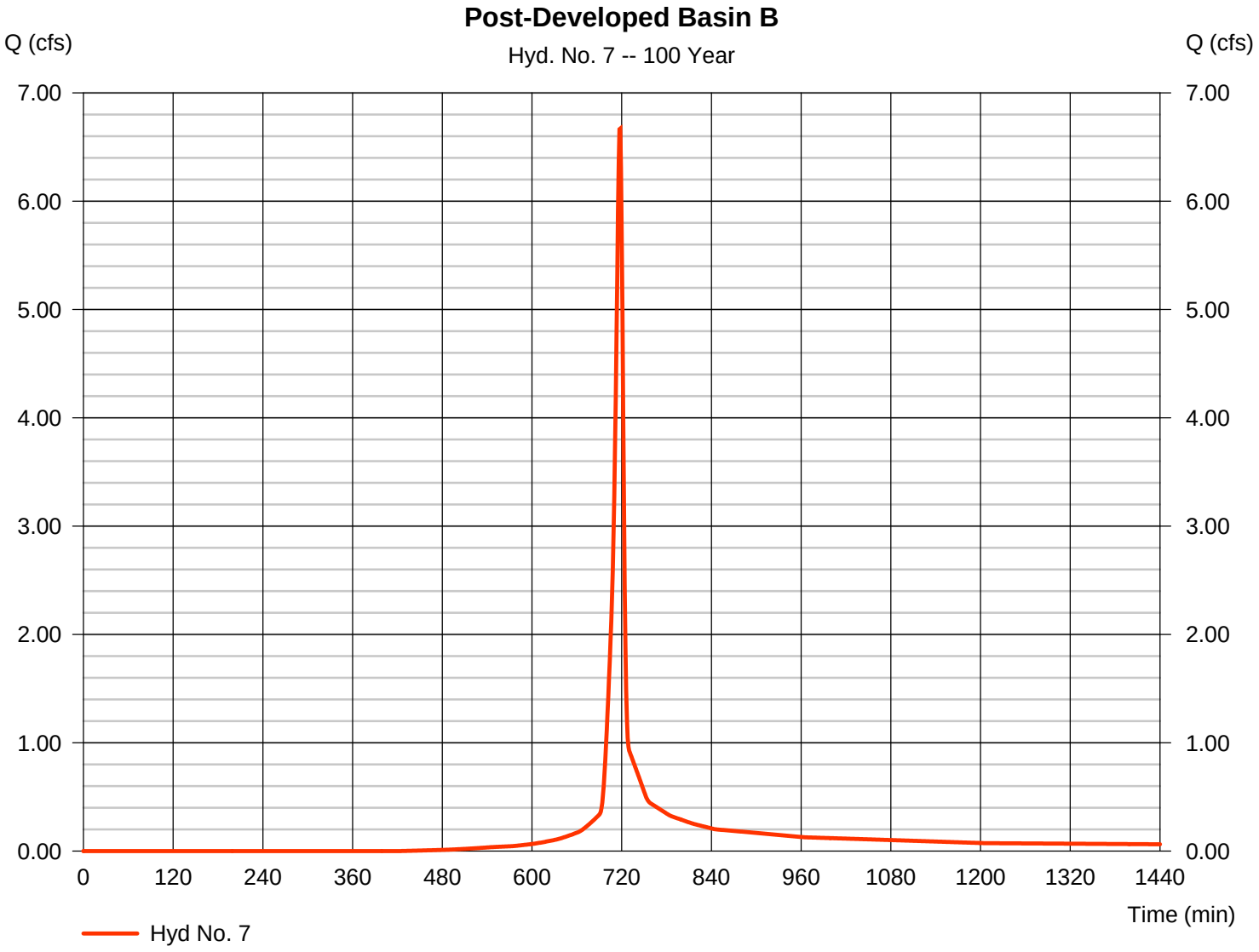
Hydrograph Report

Hyd. No. 7

Post-Developed Basin B

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.670 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	13,676 cuft
Drainage area	=	0.790 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.50 min
Total precip.	=	7.92 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.250 x 98) + (0.440 x 61) + (0.100 x 55)] / 0.790



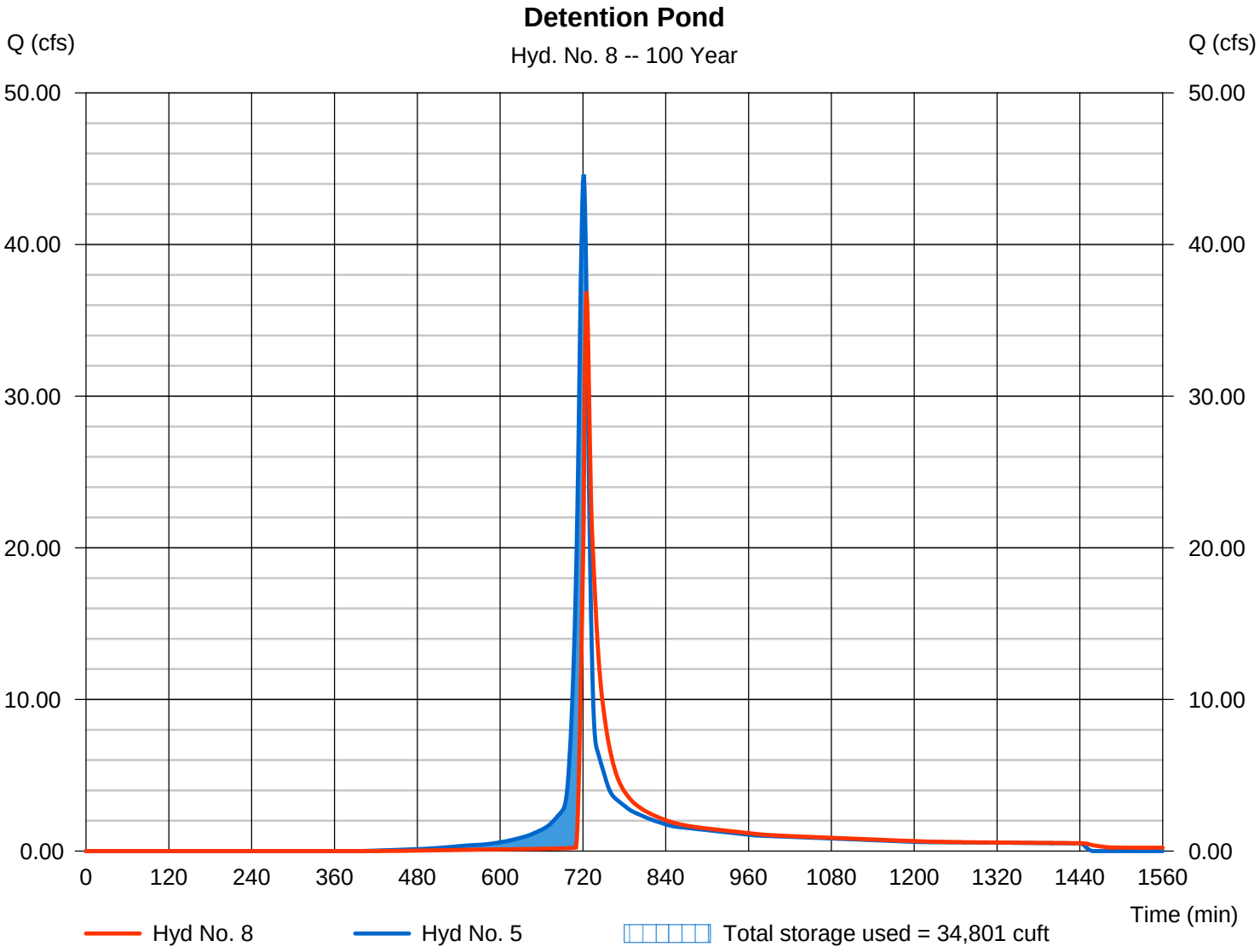
Hydrograph Report

Hyd. No. 8

Detention Pond

Hydrograph type	=	Reservoir	Peak discharge	=	36.92 cfs
Storm frequency	=	100 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	111,796 cuft
Inflow hyd. No.	=	5 - Post-Developed Basin A1 (Total Flow)	Max. Elevation	=	1418.89 ft
Reservoir name	=	Detention Pond	Max. Storage	=	34,801 cuft

Storage Indication method used.

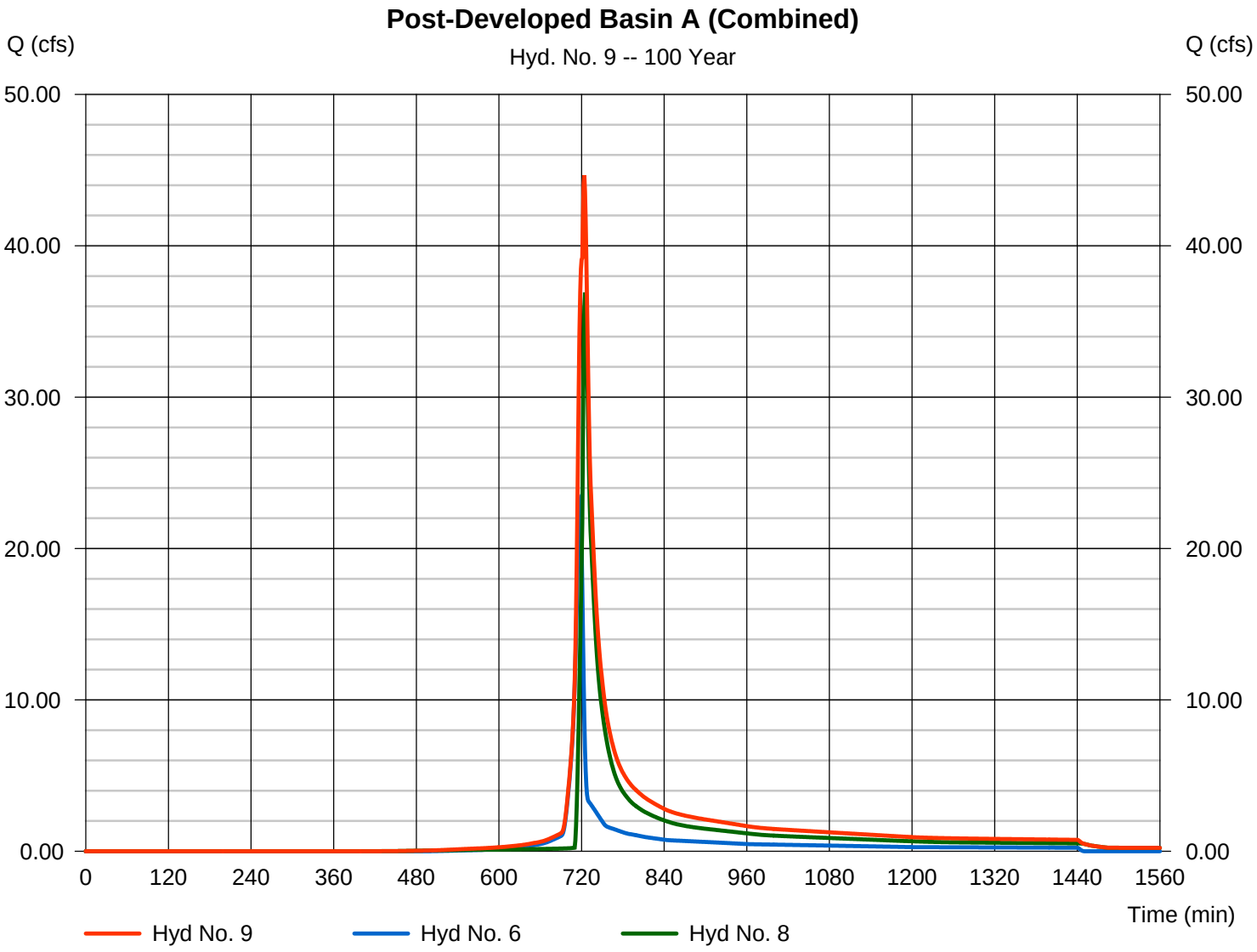


Hydrograph Report

Hyd. No. 9

Post-Developed Basin A (Combined)

Hydrograph type	= Combine	Peak discharge	= 44.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 158,853 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 3.100 ac



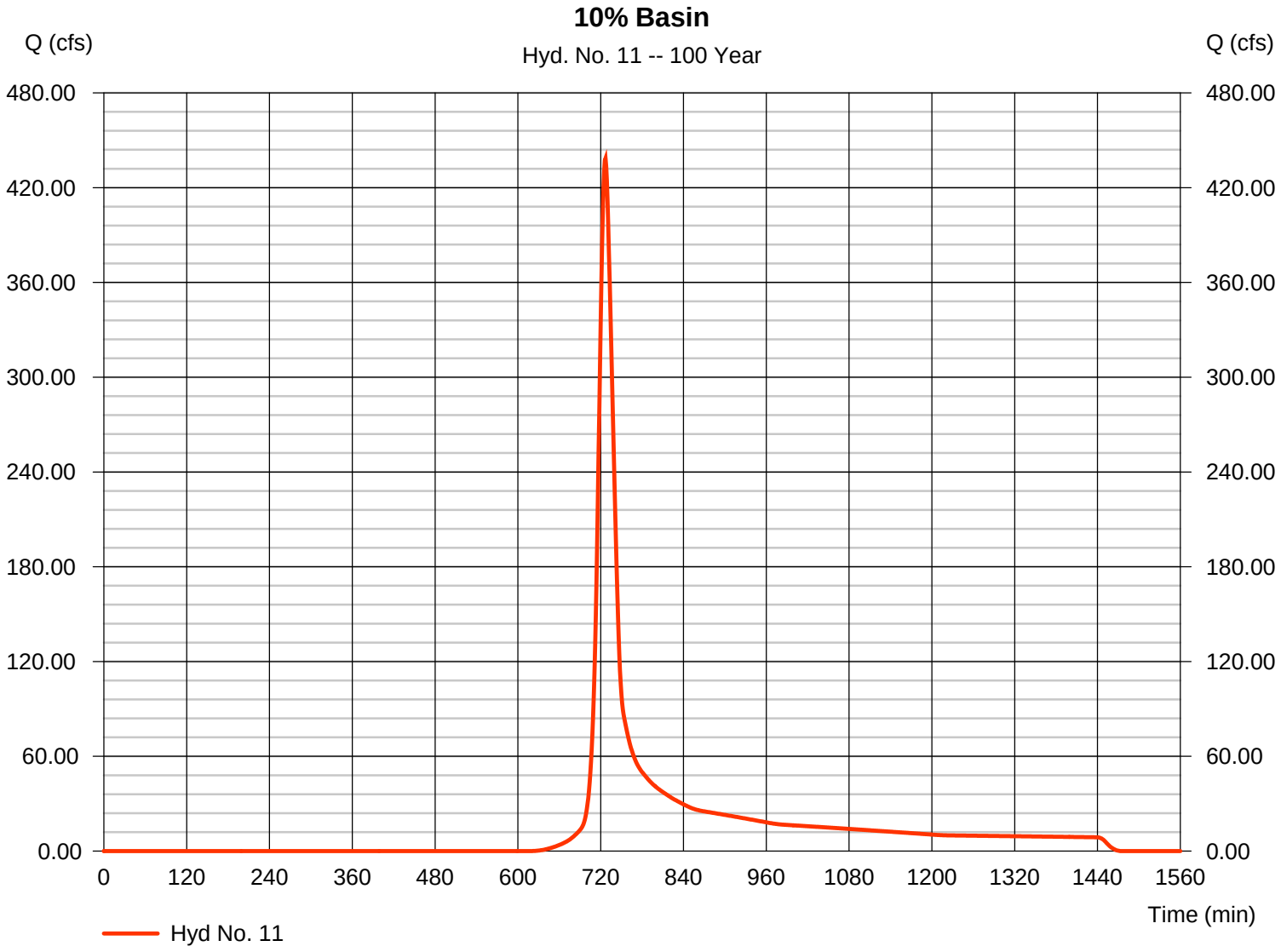
Hydrograph Report

Hyd. No. 11

10% Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	438.50 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	1,486,437 cuft
Drainage area	=	137.700 ac	Curve number	=	57*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	21.20 min
Total precip.	=	7.92 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(5.490 x 98) + (9.790 x 61) + (122.420 x 55)] / 137.700

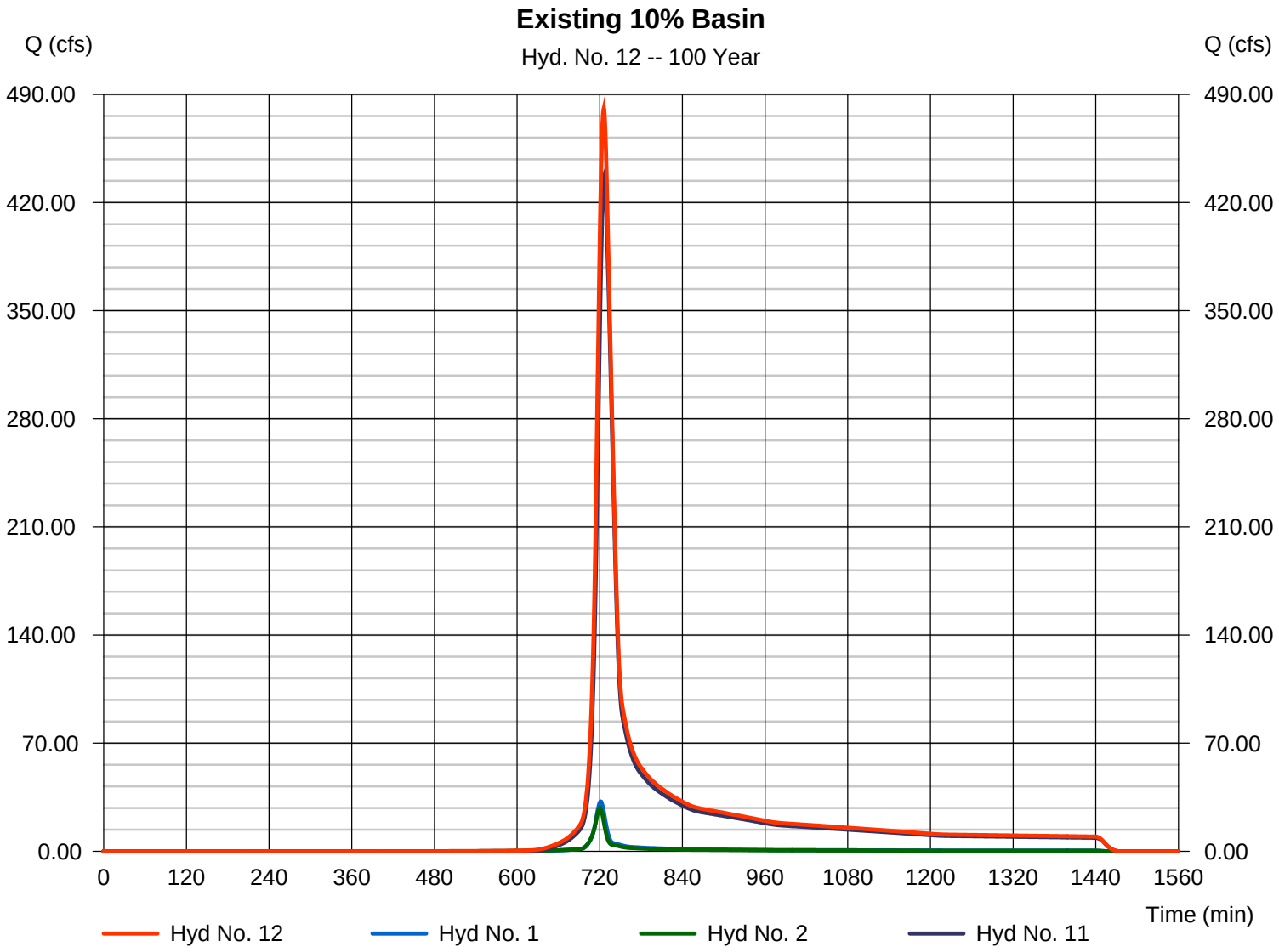


Hydrograph Report

Hyd. No. 12

Existing 10% Basin

Hydrograph type	=	Combine	Peak discharge	=	481.06 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	1,635,756 cuft
Inflow hyds.	=	1, 2, 11	Contrib. drain. area	=	148.010 ac

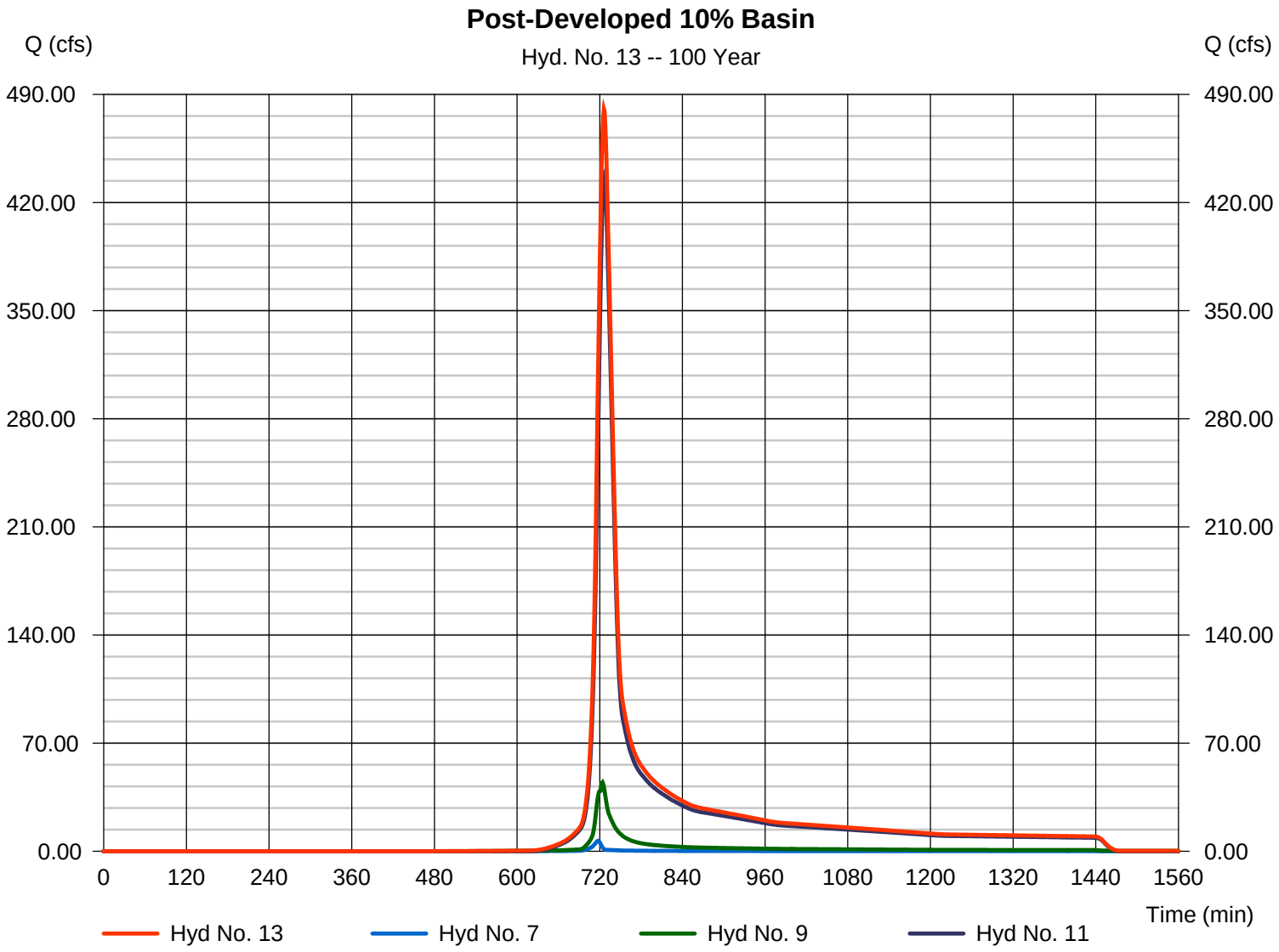


Hydrograph Report

Hyd. No. 13

Post-Developed 10% Basin

Hydrograph type	= Combine	Peak discharge	= 480.49 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 1,658,965 cuft
Inflow hyds.	= 7, 9, 11	Contrib. drain. area	= 138.490 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	35.5999	7.1000	0.7545	--------
2	64.2654	11.8000	0.8472	--------
3	0.0000	0.0000	0.0000	--------
5	65.2361	12.4000	0.7948	--------
10	67.8697	12.8000	0.7709	--------
25	73.1616	13.1000	0.7481	--------
50	81.6503	13.8000	0.7459	--------
100	89.0424	14.2000	0.7417	--------

File name: Atlanta.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	5.43	4.18	3.44	2.95	2.60	2.33	2.12	1.95	1.80	1.68	1.58	1.49
2	5.89	4.72	3.96	3.43	3.03	2.72	2.47	2.27	2.10	1.95	1.83	1.72
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.74	5.51	4.70	4.11	3.67	3.32	3.04	2.81	2.61	2.44	2.30	2.17
10	7.37	6.09	5.23	4.60	4.13	3.75	3.44	3.19	2.97	2.79	2.63	2.49
25	8.38	6.98	6.03	5.34	4.80	4.38	4.03	3.75	3.50	3.29	3.11	2.95
50	9.15	7.68	6.66	5.91	5.33	4.87	4.49	4.18	3.91	3.68	3.48	3.30
100	9.95	8.38	7.29	6.48	5.86	5.36	4.95	4.61	4.32	4.06	3.84	3.65

Tc = time in minutes. Values may exceed 60.

Precip. file name: I:\Engineering\Reference\Hydrology & SWM GO-By\PCP Tables (Hydraflow)\Atlanta GA.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	3.36	4.08	1.20	4.80	5.52	6.48	7.20	7.92
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Appendix C

DAWSON SENIOR CENTER WQ

Volume Req.d:

Total on-site area = 6.55 AC
Total impervious = 2.29 AC

$\Rightarrow WQ_v = (1.2)(R_v)(A)/12$ $\qquad I = \frac{2.29}{6.55} = 35.0\%$

$R_v = 0.05 + 0.009(I)$
$= 0.05 + 0.009(35.0\%)$
$= 0.3665$

$WQ_v = \frac{(1.2)(0.3665)(6.55\,AC)(43560\ ft^2/ac)}{12}$

$= 10414\ FT^3$ (elevation: 1415.16)

$\Rightarrow$ Size WQ orfice:

- $Q_{AVG} = \frac{10414\ ft^3}{(24 \times 3600)} = 0.12\ CFS$

- $h_{avg} = \frac{1415.16 - 1411}{2} = 2.08\ FT$

- $A_o = \frac{Q_{AVG}}{C\sqrt{2gh}} = \frac{0.12}{0.6\sqrt{2(32\ ft/s^2)(2.08)}} = 0.017\ FT^2$

- $D = 2\sqrt{\frac{0.017\ ft^2}{\pi}} = 0.149\ ft = 1.78$ inches $\longrightarrow$ Use 2 inch orfice

Appendix D

Dry Detention Basins

A dry detention basin is a storage basin designed to provide water quantity control through detention of stormwater runoff. The purpose of detention is to allow some of the water to exfiltrate into the ground and the remainder of the water to release slowly over a period of time to reduce downstream water quantity impacts. Dry detention basins are designed to completely drain following a storm event and are normally dry between rain events. They provide limited pollutant removal benefits and are not intended for water quality treatment alone.

There are some common problems to be aware of when maintaining a dry detention basin. They include, but are not limited to, the following:

- Sediment build-up
- Trash, litter, and debris accumulation
- Clogging and structural repairs in the inlet and outlet structures
- Establishing vegetation within the dry detention basin
- Erosion
- Mowers compacting and rutting the basin bottom
- Mosquitoes breeding in the practice
- Ant mounds

Routine maintenance should be performed on the dry detention basins to ensure that the structure is properly functioning. Note that during the first year the dry detention basin is built, maintenance may be required at a higher frequency to ensure the proper establishment of vegetation in the practice. In the event of snow, check to make sure that the materials used to de-ice the surrounding areas stay out of the practice to avoid clogging and further pollution.

Dry detention basins should be inspected after a large rainstorm. Keep drainage paths, both to and from the BMP, clean so that the water can properly infiltrate into the ground. Note that it might take longer for the water to infiltrate into the ground during the winter months and early spring. If the dry detention basin is not draining properly, check for clogging of the inflow and outflow structures.

If the forebay or dry detention basin has received a significant amount of sediment over a period of time, then the sediment at the bottom of the forebay or dry detention basin may need to be removed. Accumulated sediment in the practice decreases the available storage volume and affects the basin's ability to function as it was designed.

If designed and maintained correctly, dry detention basins should not become a breeding ground for mosquitoes. A mosquito egg requires 24-48 hours to hatch. In addition, it takes 10-14 more days for the egg to develop and become an adult. By having a dry detention basin that drains properly, it is unlikely that a dry detention basin would provide a habitat that could become a breeding area for mosquitoes. Should the dry detention basin become a breeding ground for mosquitoes, the problem is likely with the overflow structure which may need to be addressed.

The table below shows a schedule for when different maintenance activities should be performed on the dry detention basins.

Dry Detention Basin Typical Routine Maintenance Activities and Schedule

Activity	Schedule
• Remove debris from basin surface to minimize outlet clogging and improve aesthetics. • Note erosion of detention basin banks or bottom • Inspect for damage to the embankment. • Monitor for sediment accumulation in the facility and forebay. • Examine to ensure that inlet and outlet devices are free of debris and operational.	Annually and following significant storm events
• Remove sediment buildup. • Repair and revegetate undercut and/or eroded areas. • Perform structural repairs to inlet and outlets. • Repair undercut or eroded areas. • Mow side slopes. • Seed or sod to restore dead or damaged ground cover.	As needed based on inspection
• Mow to limit unwanted vegetation. • Litter/ Debris Removal.	Routine

Dry Detention Basin					
Maintenance Item	Condition				Comment
	Good	Marginal	Poor	N/A*	
General Inspection					
Access to the site is adequately maintained for inspection and maintenance.					
Area is clean (trash, debris, grass clippings, etc. removed).					
Inlet Structure					
Drainage ways (overland flow or pipes) to the practice are free of trash, debris, large branches, etc.					
Area around the inlet structure is mowed and grass clippings are removed.					
No evidence of gullies, rills, or excessive erosion around the inlet structure.					
Water is going through structure (i.e. no evidence of water going around the structure).					
Inlet pipe is in good condition and is not clogged.					
Diversion structure (high flow bypass structure or other) is free of trash, debris, or sediment. Comment on overall condition of diversion structure and list type.					
Pretreatment (forebay)					
Area is free of trash, debris, and sediment.					
Sediment accumulation is less than 50% of the forebay volume.					
No undesirable vegetation within the forebay. Weeds are removed to prevent clogging.					
Erosion protection is present on site (i.e. turf reinforcement mats). Comment on types of erosion protection and evaluate condition.					
Main Treatment					
Main treatment area is free of trash, debris, and sediment.					
Erosion protection is present on site (i.e. turf reinforcement mats). Comment on types of erosion protection and evaluate condition.					
No evidence of long-term ponding or standing water in the ponding area of the practice (examples include: stains, odors, mosquito larvae, etc.).					

Dry Detention Basin					
Maintenance Item	Condition				Comment
	Good	Marginal	Poor	N/A*	
Basin seems to be working properly. No settling around the basin. Comment on overall condition of basin.					
Vegetation within and around practice is maintained. Grass clippings are removed.					
Sediment accumulation within dry detention basin is less than 3 inches.					
No standing water within the basin.					
No evidence of use of fertilizer on grass (fertilizer crusting on the surface of the soil, tips of leaves turning brown or yellow, blackened roots, etc.).					
Emergency Overflow					
Emergency overflow is free of trash, debris, and sediment.					
No evidence of erosion, scour, or flooding around the structure.					
No shrubs or trees growing on embankment.					
No signs of seepage on the downstream face.					
No signs of animal activity.					
Outlet Structure					
Outlet structure is free of trash, debris, and sediment.					
No evidence of erosion, scour, or flooding around the structure.					
All moveable components are operational.					
Results					
Overall condition of Dry Detention Basin:					
Additional Comments					
Notes: * If a specific maintenance item was not checked, please check N/A and explain why in the appropriate comment box.					

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and Drawing conventions.
6. Owner-furnished products.
7. Other Relevant Packages

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Dawson County Senior Center.

1. Project Location: Adjacent to and west of the existing Marjorie Weaver Senior Center which is located at 201 Recreation Road, Dawsonville, GA 30534 .

B. Owner: Dawson County Board of Commissioners.

1. Owner's Representative: Melissa Hawk.

C. Architect: Christian Springfield, Wakefield Beasley & Associates Architects, Inc., 5200 Avalon Boulevard, Alpharetta, GA 30009, 770-209-9393.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Mechanical, Electrical, & Plumbing: Trip Walters, Griffith Engineering, 4360 Chamblee Dunwoody Road Suite 210 Atlanta, Ga 30303.

2. Civil: Jack Johnson, Forsite Group, Inc., 3740 Davinci Ct., Suite 100, Peachtree Corners, GA 30092.

3. Structural: Karen Jenkins, Shear Structural, 931 Monroe Drive, Atlanta, GA 30308.

E. Web-Based Project Software: Newforma will be used as the project software administered by Architect for purposes of managing communication and documents during the construction stage.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. A new pavilion, walking trail, relocated playground, amp theater space, and grill area. located northwest of the newly proposed Senior Center. The work will require a regrade of the existing baseball field located north of the proposed Senior Center to a lower elevation to acquire fill material for the senior center project and pavilion scope of work. See site package for further information on regrading. The baseball field will be replaced with a Multi-Purpose sports field primarily for youth football practice.
2. Within the pavilion will be a small restroom building with men's, women's, and family restrooms, as well as an electrical room and water fountains capped with a metal roof and clearstory windows of translucent polycarbonate.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: 7:00am to 5:00pm.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than three days in advance of proposed utility interruptions. To the adjacent facility

D. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by schedule on Drawings.
3. Keynoting: If materials and products are identified by reference keynotes, they reference specification section numbers found in this project manual.

1.8 Owner Furnished Products

A. Products shown in plan to be provided and installed by owner:
1. Door hardware

B. Contractor to confirm power and required low voltage to be coordinated with Owner.

1.9 Other Relevant Packages:

A. Other packages prepared for reference only. Contractor to be responsible for coordination between contractors:
1. Dawson County Senior Center Package
2. Dawson County Senior Center Site Package

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
3. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
4. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
   1. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a project specific transmittal form

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

   1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email or Newforma. Include PDF transmittal form. Include information in email subject line as requested by Architect.

      a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.

      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

   1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 5 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts (Architect will require physical samples to make final selections).
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data with Shop Drawings and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm) .

    a. One PDF electronic file.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Web-Based Project Software(Newforma): Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in PDF tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action**.**

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action**.**

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Mock-ups.

D. Control of installation.

E. Tolerances.

F. Testing and inspection services.

G. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 – Submittal Procedures.

1.03 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2011.

1.04 SUBMITTALS

A. Design Data: Submit for Architect'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.

B. Test Reports: After each test/inspection, promptly submit two copies of report to the Architect 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 the Architect, provide interpretation of results.
2. Test report submittals are for the Architect'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.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to the Architect, 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.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

A. Contractor will employ and pay for services of an independent testing agency to perform specified testing required by the Construction Documents.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

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 the Architect 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 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by the Architect/Owner, and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from the Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with the Architect/Owner 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 the Architect of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by the Architect/Owner.
   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 the Architect.
   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 the Architect 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 beyond specified requirements.

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

F. Re-testing required because of non-conformance to specified requirements shall be paid for by the Contractor.

3.05 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, 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.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 01 40 00

SECTION 014525 - STRUCTURAL TESTING/INSPECTION AGENCY SERVICES

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Section summarizes the responsibility of the Contractor and the Structural Testing/Inspection Agency in the performance of the testing/inspection specified in the Contract Documents.

B. Neither the observation of the Design Professional in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Design Professional shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

1.2 REFERENCES

A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. American Council of Independent Laboratories - Recommended Requirements for Independent Laboratories Qualifications.

1.3 SELECTION AND PAYMENT

A. Owner will employ and pay for the structural testing/inspection services that are required by the Contract Documents.

B. Contractor shall pay for any additional structural testing/inspection required for work or materials not complying with Contract Documents due to negligence or nonconformance.

C. Contractor shall pay for any additional structural testing/inspection required for his convenience.

D. Qualifications: Minimum Special Inspector qualifications shall be per Table 1704.2.1 of the International Building Code (2012 Edition).

1.4 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

A. Specific structural testing/inspection requirements are given in the following specification sections:

Specification 031000 Concrete Formwork Inspection

Specification 032000	Concrete Reinforcement Inspection
Specification 033000	Concrete Testing/Inspection
Specification 036200	Non-Shrink Grout Inspection
Specification 312301	Excavating, Backfilling, and Compacting for Structures

1.5 STATEMENT OF SPECIAL INSPECTIONS

A. Provide testing/inspection required to meet the provisions of the Schedule of Special Inspection Services below.

PART 2 - MATERIALS

NOT USED

PART 3 - EXECUTION

3.1 STRUCTURAL PRECONSTRUCTION MEETING

A. A structural preconstruction meeting may be conducted at the construction site by the Design Professional to discuss quality issues. The parties involved may be the Design Professional, Contractor, Structural Testing/Inspection Agency, appropriate subcontractors, suppliers, and detailers.

3.2 STRUCTURAL TESTING/INSPECTION AGENCY'S RESPONSIBILITIES

A. Cooperate with the Contractor and provide timely service.

B. Upon arriving at the construction site, sign in and notify the Contractor of presence.

C. Select the representative samples that are to be tested/ inspected.

D. Perform tests/ inspections as outlined in Contract Documents, the applicable codes, and as directed by the Design Professional.

E. Report work and materials not complying with Contract Documents immediately to the Contractor and Design Professional.

F. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of work or materials tested/inspected, whether the work or materials complies with Contract Documents and name of the Structural Testing/Inspection Agency's representative.

G. Report and distribute results of tests/inspections promptly in the form of written reports as directed by the Design Professional.

H. Structural Testing/Inspection Agency shall not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Contractor.

3.3 CONTRACTOR'S RESPONSIBILITIES

A. Provide copy of Contract Documents to the Structural Testing/Inspection Agency.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Structural Testing/Inspection Agency and provide access to work.

E. Provide samples of materials to be tested in required quantities.

F. Furnish copies of mill test reports when requested.

G. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples.

H. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.

3.4 OPTIONS

A. If the Structural Testing/Inspection Agency is located at such a distance from the project that travel expenses will be a consideration, or if the amount of sampling performed is minor, and by mutual agreement of the Design Professional and Contractor, the Contractor may be requested to take samples and forward them to the Structural Testing/Inspection Agency for testing/inspection.

END OF SECTION 014525

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SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	Dawson County Senior Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.2.5 Inspection of Fabricators					
Verify fabrication/quality control procedures	In-plant review (3)	Y	Periodic	1	
1705.1.1 Special Cases (work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements)	Submittal review, shop (3) and/or field inspection	N			
1705.2 Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 360, chapter N, paragraph 3.2 for compliance with construction documents)	Submittal Review	Y	Each submittal		
2. Material verification of structural steel	Shop (3) and field inspection	Y	Periodic		
3. Embedments (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Y	Periodic		
4. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Y	Periodic		
5. Structural steel welding:		Y			
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)		
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection	Y	Observe (4)		
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)		
d. Nondestructive testing (NDT) of welded joints: *see Commentary*		Y			
1) Complete penetration groove welds 5/16" or greater in *risk category* III or IV	Shop (3) or field ultrasonic ing - 100%	N	Periodic		
2) Complete penetration groove welds 5/16" or greater in *risk category* II	Shop (3) or field ultrasonic testing - 10% of welds minimum	Y	Periodic		
3) Thermally cut surfaces of access holes when material t > 2"	Shop (3) or field magnetic Partical or Penetrant testing	N	Periodic		
4) Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing	N	Periodic		
5) Fabricator's NDT reports when fabricator performs NDT	Verify reports	Y	Each submittal (5)		
6. Structural steel bolting:	Shop (3) and field inspection	Y			
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360, Table N5.6-1)		Y	Observe or Perform as noted (4)		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	Dawson County Senior Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
b.Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360, Table N5.6-2)		Y	Observe (4)		
1) Pre-tensioned and slip-critical joints		Y			
a) Turn-of-nut with matching markings		Y	Periodic		
b) Direct tension indicator		Y	Periodic		
c) Twist-off type tension control bolt		Y	Periodic		
d) Turn-of-nut without matching markings		Y	Continuous		
e) Calibrated wrench		Y	Continuous		
2) Snug-tight joints		Y	Periodic		
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)		Y	Perform (4)		
7. Inspection of steel elements of composite construction prior to concrete placement in accordance with QA tasks listed in AISC 360, Table N6.1	Shop (3) and field inspection and testing	N	Observe or Perform as noted (4)		
1705.2.2 Steel Construction Other Than Structural Steel		N			
1. Material verification of cold-formed steel deck:					
a. Identification markings	Field inspection		Periodic		
b. Manufacturer's certified test reports	Submittal Review		Each submittal		
2. Connection of cold-formed steel deck to supporting structure:	Shop (3) and field inspection				
a. Welding			Periodic		
b. Other fasteners (in accordance with AISC 360,Section N6)					
1) Verify fasteners are in conformance with approved submittal			Periodic		
2) Verify fastener installation is in conformance with approved submittal and manufacturer's recommendations			Periodic		
3. Reinforcing steel	Shop (3) and field inspection				
a. Verification of weldability of steel other than ASTM A706			Periodic		
b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, boundary elements of special concrete structural walls and shear reinforcement			Continuous		
c. Shear reinforcement			Continuous		
d. Other reinforcing steel			Periodic		
4. Cold-formed steel trusses spanning 60 feet or greater					
a. Verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection		Periodic		
1705.3 Concrete Construction		Y			
1. Inspection of reinforcing steel installation (see 1705.2.2 for welding)	Shop (3) and field inspection	Y	Periodic	1	
2. Inspection of prestressing steel installation	Shop (3) and field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	**Dawson County Senior Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
3. Inspection of anchors cast in concrete where allowable loads have been increased per section 1908.5 or where strength design is used	Shop (3) and field inspection	Y	Periodic	1	
4. Inspection of anchors and reinforcing steel post-installed in hardened concrete: Per research reports including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque	Field inspection	N	Periodic or as required by the research report issued by an approved source		
5. Verify use of approved design mix	Shop (3) and field inspection	Y	Periodic	1	
6. Fresh concrete sampling, perform slump and air content tests and determine temperature of concrete	Shop (3) and field inspection	Y	Continuous	1	
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Y	Continuous	1	
8. Inspection for maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Y	Periodic	1	
9. Inspection of prestressed concrete:	Shop (3) and field inspection	N			
a. Application of prestressing force			Continuous		
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system			Continuous		
10. Erection of precast concrete members		N			
a. Inspect in accordance with construction documents	Field inspection		In accordance with construction documents		
b. Perform inspections of welding and bolting in accordance with Section 1705.2	Field inspection		In accordance with Section 1705.2		
11. Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs	Review field testing and laboratory reports	N	Periodic		
12. Inspection of formwork for shape lines, location and dimensions	l inspection	N	Periodic		
13. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic	1	
1705.4 Masonry Construction		N			
(A) Level A, B and C Quality Assurance:					
1. Verify compliance with approved submittals	Field Inspection		Periodic		
(B) Level B Quality Assurance:					
1. Verification of f'm and f'_{AAC} prior to construction	Testing by unit strength method or prism test method		Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	Dawson County Senior Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
(C) Level C Quality Assurance:					
1. Verification of f'm and f'_{AAC} prior to construction and for every 5,000 SF during construction	Testing by unit strength method or prism test method		Periodic		
2. Verification of proportions of materials in premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout, as delivered to the project site	Field inspection		Continuous		
3. Verify placement of masonry units	Field Inspection		Periodic		
(D) Levels B and C Quality Assurance:					
1. Verification of Slump Flow and Visual Stability Index (VSI) of self-consolidating grout as delivered to the project	Field testing		Continuous		
2. Verify compliance with approved submittals	Field inspection		Periodic		
3. Verify proportions of site-mixed mortar, grout and prestressing grout for bonded tendons	Field Inspection		Periodic		
4. Verify grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages	Field Inspection		Periodic		
5. Verify construction of mortar joints	Field Inspection		Periodic		
6. Verify placement of reinforcement, connectors, and prestressing tendons and anchorages	Field Inspection		Level B - Periodic		
			Level C - Continuous		
7. Verify grout space prior to grouting	Field Inspection		Level B - Periodic		
			Level C - Continuous		
8. Verify placement of grout and prestressing grout for bonded tendons	Field Inspection		Continuous		
9. Verify size and location of structural masonry elements	Field Inspection		Periodic		
10. Verify type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection		Level B - Periodic		
			Level C - Continuous		
11. Verify welding of reinforcement (see 1705.2.2)	Field inspection		Continuous		
12. Verify preparation, construction, and protestion of masonry during cold weather (temperature below 40^oF) or hot weather (temperature above 90^oF)	Field inspection		Periodic		
13. Verify application and measurement of prestressing force	Field Inspection		Continuous		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	**Dawson County Senior Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
14. Verify placement of AAC masonry units and construction of thin-bed mortar joints (first 5000 SF of AAC masonry)	Field inspection		Continuous		
15. Verify placement of AAC masonry units and construction of thin-bed mortar joints (after the first 5000 SF of AAC masonry)	Field inspection		Level B - Periodic		
			Level C - Continuous		
16. Verify properties of thin-bed mortar for AAC masonry (first 5000 SF of AAC masonry)	Field inspection		Continuous		
17. Verify properties of thin-bed mortar forAAC masonry (after the first 5000 SF of AAC masonry)	Field inspection		Level B - Periodic		
			Level C - Continuous		
18. Prepare grout and mortar specimens	Field testing		Level B - Periodic		
			Level C - Continuous		
19. Observe preparation of prisms	Field inspection		Level B - Periodic		
			Level C - Continuous		
1705.5 Wood Construction					
1. Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2.5	In-plant review (3)	Y	Periodic	1	
2. For high-load diaphragms, verify grade and thickness of structural panel sheathing agree with approved building plans	Field inspection	N	Periodic		
3. For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agree with approved building plans	Field inspection	N	Periodic		
4. Metal-plate-connected wood trusses spanning 60 feet or greater: verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic		
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	
3. Perform classification and testing of controlled fill materials.	Field inspection	Y	Periodic	1	
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous	1	
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	**Dawson County Senior Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.7 Driven Deep Foundations		N			
1. Verify element materials, sizes and lengths comply with requirements	Field inspection		Continuous		
2. Determine capacities of test elements and conduct additional load tests, as required	Field inspection		Continuous		
3. Observe driving operations and maintain complete and accurate records for each element	Field inspection		Continuous		
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	Field inspection		Continuous		
5. For steel elements, perform additional inspections per Section 1705.2	See Section 1705.2		See Section 1705.2		
6. For concrete elements and concrete-filled elements, perform additional inspections per Section 1705.3	See Section 1705.3		See Section 1705.3		
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge	Field inspection		In accordance with construction documents		
8. Perform additional inspections and tests in accordance with the construction documents	Field Inspection and testing		In accordance with construction documents		
1705.8 Cast-in-Place Deep Foundations		N			
1.Observe drilling operations and maintain complete and accurate records for each element	Field inspection		Continuous		
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes	Field inspection		Continuous		
3. For concrete elements, perform additional inspections in accordance with Section 1705.3	See Section 1705.3		See Section 1705.3		
4. Perform additional inspections and tests in accordance with the construction documents	Field Inspection and testing		In accordance with construction documents		
1705.9 Helical Pile Foundations		N			
1. Verify installation equipment, pile dimensions, tip elevations, final depth, final installation torque and other data as required.	Field inspection		Continuous		
2. Perform additional inspections and tests in accordance with the construction documents	Field Inspection and testing		In accordance with construction documents		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	**Dawson County Senior Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.10.1 Structural Wood Special Inspections For Wind Resistance		N			
1. Inspection of field gluing operations of elements of the main windforce-resisting system	Field inspection		Continuous		
2. Inspection of nailing, bolting, anchoring and other fastening of components within the main windforce-resisting system	Shop (3) and field inspection		Periodic		
1705.10.2 Cold-formed Steel Special Inspections For Wind Resistance		N			
1.Inspection during welding operations of elements of the main windforce-resisting system	Shop (3) and field inspection		Periodic		
2.Inspections for screw attachment, bolting, anchoring and other fastening of components within the main windforce-resisting system	Shop (3) and field inspection		Periodic		
1705.10.3 Wind-resisting Components		N			
1. Roof cladding	Shop (3) and field inspection		Periodic		
2. Wall cladding	Shop (3) and field inspection		Periodic		
1705.11.1 Structural Steel Special Inspections for Seismic Resistance		N			
Inspection of structural steel in accordance with AISC 341	Shop (3) and field inspection		In accordance with AISC 341		
1705.11.2 Structural Wood Special Inspections for Seismic Resistance		N			
1. Inspection of field gluing operations of elements of the seismic-force resisting system	Field inspection		Continuous		
2. Inspection of nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system	Shop (3) and field inspection		Periodic		
1705.11.3 Cold-formed Steel Light-Frame Construction Special Inspections for Seismic Resistance		N			
1. Inspection during welding operations of elements of the seismic-force-resisting system	Shop (3) and field inspection		Periodic		
2. Inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system	Shop (3) and field inspection		Periodic		
1705.11.4 Designated Seismic Systems Verification		N			
Inspect and verify that that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with Section 1705.12.3	Field inspection		Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	Dawson County Senior Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.11.5 Architectural Components Special Inspections for Seismic Resistance		N			
1. Inspection during the erection and fastening of exterior cladding and interior and exterior veneer	Field inspection		Periodic		
2. Inspection during the erection and fastening of interior and exterior nonbearing walls	Field inspection		Periodic		
3. Inspection during anchorage of access floors	Field inspection		Periodic		
1705.11.6 Mechanical and Electrical Components Special Inspections for Seismic Resistance		N			
1. Inspection during the anchorage of electrical equipment for emergency or standby power systems	Field inspection		Periodic		
2. Inspection during the anchorage of other electrical equipment	Field inspection		Periodic		
3. Inspection during installation and anchorage of piping systems designed to carry hazardous materials, and their associated mechanical units	Field inspection		Periodic		
4. Inspection during the installation and anchorage of HVAC ductwork that will contain hazardous materials	Field inspection		Periodic		
5. Inspection during the installation and anchorage of vibration isolation systems	Field inspection		Periodic		
1705.11.7 Storage Racks Special Inspections for Seismic Resistance		N			
Inspection during the anchorage of storage racks 8 feet or greater in height	Field inspection		Periodic		
1705.11.8 Seismic Isolation Systems		N			
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system	Shop and field inspection		Periodic		
1705.12.1 Concrete Reinforcement Testing and Qualification for Seismic Resistance		N			
1. Review certified mill test reports for each shipment of reinforcement used to resist earthquake-induced flexural and axial forces in reinforced concrete special moment frames, special structural walls, and coupling beams connecting special structural walls	Review certified mill test reports		Each shipment		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	**Dawson County Senior Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
2. Verify reinforcement weldability of ASTM A615 reinforcement used to resist earthquake-induced flexural and axial forces in reinforced concrete special moment frames, special structural walls, and coupling beams connecting special structural walls	Review test reports		Each shipment		
1705.12.2 Structural Steel Testing and Qualification for Seismic Resistance		N			
Test in accordance with the quality assurance requirements of AISC 341	Shop (3) and field testing		Per AISC 341		
1705.12.3 Seismic Certification of Nonstructural Components		N			
Review certificate of compliance for designated seismic system components.	Certificate of compliance review		Each submittal		
1705.12.4 Seismic Isolation Systems		N			
Test seismic isolation system in accordance with ASCE 7 Section 17.8	Prototype testing		Per ASCE 7		
1705.13 Sprayed Fire-resistant Materials					
1. Verify surface condition preparation of structural members	Field inspection	N	Periodic		
2. Verify application of sprayed fire-resistant materials	Field inspection	N	Periodic		
3. Verify average thickness of sprayed fire-resistant materials applied to structural members	Field inspection	N	Periodic		
4. Verify density of the sprayed fire-resistant material complies with approved fire-resistant design	Field inspection and testing	N	Per IBC Section 1705.13.5		
5. Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material	Field inspection and testing	N	Per IBC Section 1705.13.6		
1705.14 Mastic and Intumescent Fire-Resistant Coatings					
Inspect mastic and intumescent fire-resistant coatings applied to structural elements and decks	Field inspection	N	Periodic		
1705.15 Exterior Insulation and Finish Systems (EIFS)					
1. Verify materials, details and installations are per the approved construction documents	Field inspection	N	Periodic		
2. Inspection of water-resistive barrier over sheathing substrate	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	Dawson County Senior Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.16 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop	Field testing	N	Per ASTM E2174		
2. Inspect fire-resistant joint systems	Field testing	N	Per ASTM E2393		
1705.17 Smoke Control Systems					
1. Leakage testing and recording of device locations prior to concealment	Field testing	N	Periodic		
2. Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification	Field testing	N	Periodic		

* INSPECTION AGENTS FIRM	ADDRESS	TELEPHONE NO.
1. TESTING AGENT TO BE DETERMINED		
4.		

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. Special Insepctions as required by Section 1704.2.5 are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.2

4. Observe on a random basis, operations need not be delayed pending these inspections. Perform these tasks for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N7.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? **No**

Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*? **No**

DATE: 1/31/2019

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: Dawson County Senior Center

LOCATION: 201 Recreation Rd, Dawsonville, GA 30534

PERMIT APPLICANT: Christian Springfield Wakefield Beasley and Associates,

APPLICANT'S ADDRESS: 5200 Avalon Blvd, Building 5000, Alpharetta, GA 30009

ARCHITECT OF RECORD: Mark Schroeder, AIA

STRUCTURAL ENGINEER OF RECORD: Karen M. Jenkins, P.E.

MECHANICAL ENGINEER OF RECORD: Michael C. Griffith

ELECTRICAL ENGINEER OF RECORD: Thomas G. White

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: Karen M. Jenkins, P.E.

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2012 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly X__Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Karen Jenkins

Type or print name

Signature July 1, 2018
Date

Building Official's Acceptance:

Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the

specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    a. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

    a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

    a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered

    a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.

B. Related Requirements:
1. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Final Property Survey: Submit two paper copies and one PDF electronic file showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site if applicable.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control

of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mmin occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:
1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and] proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 10 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by uploading to web-based project software site (Newforma).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.

p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect by uploading to web-based project software site (Newforma). Enable reviewer comments on draft submittals.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 20 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 10 days of receipt of Architect's comments and prior to commencing demonstration and training.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.

9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent,

and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:

a. Final Submittal:

1) Submit one paper-copy set of marked-up record prints.
2) Submit PDF electronic files of scanned record prints.
3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

C. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor and videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.

d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Pre-instruction Conference: Conduct conference at Project site to review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.

h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner**,** through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.

1. Submit video recordings on CD-ROM or thumb drive.
2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

a. Name of Contractor/Installer.
b. Business address.
c. Business phone number.

d. Point of contact.
e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 031000 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the design and erection of formwork, shoring and reshoring for cast-in-place concrete and accessories.

1.2 RELATED SECTIONS

A. Section 032000 - Concrete Reinforcement.

B. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Standard Specifications for Structural Concrete.

C. ACI 318 - Building Code Requirements for Structural Concrete.

D. ACI 347 - Recommended Practice for Concrete Formwork.

E. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

F. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.4 SUBMITTALS

A. Submit manufacturer's data for waterstops, formwork accessories, inserts, form release agent, and isolation joint filler.

1.5 DESIGN OF FORMWORK

A. Design of formwork, shoring, and reshoring and its removal is the Contractor's responsibility.

B. Design of formwork, shoring, and reshoring shall conform to ACI 117, ACI 301, ACI 318, and ACI 347.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Construct forms with wood, plywood, metal, fiberglass or a combination of these.

B. Form materials shall have sufficient strength to prevent distortion.

2.2 FORMWORK ACCESSORIES

A. Formwork accessories that are embedded in concrete, including ties and hangers, shall be commercially manufactured products. Do not use nonfabricated wire form ties.

2.3 FORM RELEASE AGENT

A. Form release agent shall not bond with, stain, nor adversely affect concrete surfaces.

2.4 ISOLATION JOINT FILLER

A. Asphalt impregnated premolded fiberboard isolation joint filler shall conform with ASTM D1751 and be 1/2-inch thick by full thickness of slab or joint, unless indicated otherwise on the Drawings.

2.5 CONSTRUCTION JOINTS

A. Provide key type steel forms by Vulcan screed joints, Burke Keyed Kold joint form or Form-A-Key.

PART 3 - EXECUTION

3.1 GENERAL

A. Erect formwork in accordance with ACI 301, ACI 318, and ACI 347.

B. Maintain formwork and shoring to support loads until such loads can be supported by concrete structure.

3.2 TOLERANCES

A. Finished work shall comply with ACI 117 tolerances.

3.3 SURFACE PREPARATION

A. For concrete exposed to view, seal form joints to prevent leakage.

B. Before reinforcement is placed, coat contact surfaces of form with form release agent in accordance with manufacturer's recommendations. Do not allow excess form release agent to accumulate in forms or come in contact with concrete surfaces against which fresh concrete will be placed.

3.5 CHAMFERS

A. Provide 3/4-inch chamfer at all corners.

3.6 FOUNDATION ELEMENTS

A. Form foundation elements if soil or other conditions are such that earth trench forms are unsuitable.

B. Sides of turned-down slabs shall be formed if soil is determined to be unsuitable to support the wet concrete.

C. Maintain minimum coverage of reinforcing steel as indicated on Structural Drawings.

3.7 INSERTS

A. Locate anchor bolts by using templates with two nuts to secure in position.

3.8 EMBEDS

A. Set and secure embedded plates, bearing plates, and anchor bolts in accordance with approved setting drawings and in such a manner to prevent displacement during placement of concrete.

3.9 FORM REMOVAL

A. Remove forms carefully in such manner and at such time as to ensure complete safety of structure. Do not remove forms shoring until members have acquired sufficient strength to support their weight and the load thereon safely.

3.10 PROVISIONS FOR OTHER TRADES

A. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings and recesses from trades providing such items.

B. Accurately place and securely support items built into forms. Obtain approval for openings not shown on Drawings.

3.11 CLEANING

A. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed.

3.12 FORM SURFACES

A. Coat contact surfaces of forms with a formcoating compound before reinforcement is placed. Apply in accordance with manufacturer's recommendations. Rust-stained steel formwork is not acceptable.

3.13 CONSTRUCTION JOINTS

A. Provide construction joints in accordance with ACI 318.

B. Obtain Design Professional's prior approval for use and location of joints.

C. Provide 1-1/2 inch deep key type construction joints at end of each placement for slabs, beams, walls, and footings. Bevel forms for easy removal.

D. Remove loose particles and latency from surface prior to placing the next lift. Chip the surface to a depth sufficient to expose sound concrete.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 014525 - Structural Testing/Inspection Agency Services.

B. Section 031000 - Concrete Formwork.

C. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Standard Specifications for Structural Concrete.

C. ACI 315 - Details and Detailing of Concrete Reinforcement.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

F. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

G. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

H. AWS D12.1 - Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

I. AWS D1.4 - Structural Weld Code - Reinforcing Steel.

J. CRSI - Manual of Practice, and Documents 63 and 65.

1.3 SUBMITTALS

A. Submit shop drawings as follows

1. Notify Design Professional prior to detailing reinforcing steel shop drawings.

2. Indicate size, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules, splice lengths, stirrup spacing, supporting and spacing devices. Detail reinforcing steel in accordance with ACI 315 and CRSI Standards.

3. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.

4. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

B. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.

C. Submit mill test reports.

D. Submit manufacturer's data for tensile and compressive splicers.

E. Submit manufacturer's data including installation recommendations for dowel adhesive.

1.4 QUALITY ASSURANCE

A. Coordinate and schedule in a timely manner with the Structural Testing/Inspection Agency the following quality related items:

1. Verify reinforcing steel for quantity, size, location, and support.

2. Verify proper reinforcing steel concrete coverage.

B. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required by Specification 01 4525.

1.5 STORAGE AND PROTECTING

A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings which might impair bond.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deformed reinforcing steel shall conform to ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).

B. Welded steel wire fabric shall conform to ASTM A185.

2.2 ACCESSORY MATERIALS

A. Annealed steel tie wire shall be 16-1/2 gage minimum.

B. Bar supports shall be plastic-tipped steel Class I bar supports conforming to CRSI Specifications. Concrete brick may be used to support reinforcement to obtain proper clearance from earth.

2.3 SPLICERS

A. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.

B. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

2.4 DOWEL ADHESIVE

A. Adhesive for reinforcing dowels in existing concrete shall conform to ASTM C881-02, Type IV, Grade 3, CLASS A, B, & C except gel times and epoxy content. Adhesive shall consist of a two component adhesive system contained in side by side packaging connected to a mixing nozzle which thoroughly mixes the components as it is injected into the hole. Adhesive shall have passed ICC Evaluation Services, Inc. Acceptance Criteria 308 for long term creep and be specifically approved for use in cracked concrete.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate steel in accordance with ACI 318 and CRSI standards.

B. Bend bars cold. Do not heat or flame cut bars. No field bending of bars partially embedded in concrete is permitted, unless specifically approved Design Professional and checked by Testing and Inspection Agency for cracks.

C. Weld only as indicated. Perform welding in accordance with AWS D12.1 and or AWS D1.4.

D. Tag reinforcing steel for easy identification.

3.2 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles and coatings.

B. Place, support, and secure reinforcement against displacement in accordance with ACI 318 and CRSI standards. Do not deviate from alignment or measurement.

C. Place concrete beam reinforcement support parallel to main reinforcement.

D. Locate welded wire fabric in the top third of slabs. Overlap mesh one lap plus two inches at side and end joints.

E. Furnish and install dowels or mechanical splices at intersections of walls, columns and piers to permit continuous reinforcement or development lengths at such intersections.

F. Maintain cover and tolerances in accordance with ACI and CRSI Specifications, unless indicated otherwise on Structural Drawings.

3.3 SPLICES

A. Do not splice reinforcement except as indicated on Structural Drawings.

B. Tension couplers may be used and installed in accordance with manufacturer's specifications.

3.4 DOWELS IN EXISTING CONCRETE

A. Install dowels and dowel adhesive in accordance with manufacturer’s recommendations.

B. Minimum embedment length shall be 12 bar diameters, unless noted otherwise.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.2 RELATED SECTIONS

A. Section 014525 - Structural Testing/Inspection Agency Services.

B. Section 031000 - Concrete Formwork.

C. Section 032000 - Concrete Reinforcement.

D. Section 036200 - Non-Shrink Grout.

1.3 REFERENCES

A. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.

B. ACI 301 - Specifications for Structural Concrete for Buildings.

C. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

D. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

E. ACI 305 - Hot Weather Concreting.

F. ACI 306 - Cold Weather Concreting.

G. ACI 308 - Standard Practice for Curing Concrete.

H. ACI 309 - Guide for Consolidation of Concrete.

I. ACI 318 - Building Code Requirements for Structural Concrete.

J. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

K. ASTM C33 - Standard Specification for Concrete Aggregates.

L. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

M. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

N. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

O. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

P. ASTM C150 - Standard Specification for Portland Cement.

Q. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

R. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

S. ASTM C230 - Standard Specification for Flow Table or Use in Tests of Hydraulic Cement.

T. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

U. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

V. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

W. ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.

X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.4 NOTICE

A. Notify Design Professional and Structural Testing/Inspection Agency not less than 48 hours prior to placing concrete.

1.5 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Examine concrete in truck to verify that concrete appears properly mixed.

2. Perform a slump test as deemed necessary for each concrete load. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.

3. Mold four specimens per set for compressive strength testing; one set for each 75 cubic yards of each mix design placed in any one day. For each set molded, record:

a. Slump
b. Air content
c. Unit weight
d. Temperature, ambient and concrete
e. Location of placement
f. Any pertinent information, such as addition of water, addition of admixtures, etc.

Perform one 7-day and two 28-day compressive strength tests. (Use one as a spare to be broken as directed by the Design Professional if compressive strengths do not appear adequate.)

4. Report in writing, as directed by the Design Professional, on the same day that tests are performed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing agency, concrete design compressive strength, location of concrete placement in structure, concrete mix proportions and materials, compressive breaking strength and type of break.

5. Test concrete slabs for specified flatness and levelness in accordance with ASTM E1155. As a minimum, test three placements: the first placement and two additional placements as directed by the Design Professional. If the tested placement does not meet the specified overall values, test the next placement.

B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.

C. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required in Specification 01 4525.

1.6 CONCRETE MIX DESIGN

A. Establish concrete mix design proportions in accordance with ACI 318, Chapter 5.

B. Submit concrete mix designs. Include the following:

1. Type and quantities of materials.

2. Slump.

3. Air content.

4. Fresh unit weight.

5. Aggregates sieve analysis.

6. Design compressive strength.

7. Location of placement in structure.

8. Method of placement.

9. Method of curing.

10. Seven-day and 28-day compressive strengths.

C. Concrete supplier shall submit certifications that the materials used meet applicable ASTM Specifications. Mix designs not conforming to the above will be rejected.

1.7 SLUMP

A. Design concrete with a maximum slump of five inches.

B. If a slump greater than five inches is desired it shall be achieved with a high-range water reducer. Design the concrete mix with a high range water reducer slump of two and one-half inches plus or minus one and one-half inches. The maximum slump after high-range water reducers are added shall be eight inches.

1.8 FRESH UNIT WEIGHT

A. Normal weight concrete shall have a fresh unit weight of 140 to 152 pcf.

1.9 AIR CONTENT

A. No entrained air content is required in concrete placed in the foundation.

B. For normal weight concrete, entrained air content shall be five percent plus or minus one and one-half percent, unless specified otherwise.

1.10 WATER/CEMENT RATIO

A. Concrete elements shall have a maximum water cement ratio of 0.50, unless noted otherwise.

B. Air-entrained concrete shall have a maximum water cement ratio of 0.45, unless noted otherwise.

1.11 SUBMITTALS

A. Submit a concrete mix design as specified above for each type of concrete included in the work.

B. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.

C. Submit manufacturer's data including Product Data and installation instructions for the following items. Manufacturer's Data shall include the name of the manufacturer and date of the publication. All manufacturers' data shall be maintained at the project site by the contractor.

Admixtures
Curing materials
Joint sealing materials
Expansion joint filler
Patching compounds
Bonding agents

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications, published by the manufacturer of such materials are included in and are a part of these specifications. Upon request, provide certification from manufacturer or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these standards.

2.2 CONCRETE STRENGTH

A. Provide concrete strengths indicated on the Structural Drawings.

2.3 CEMENT

A. Portland cement shall conform to ASTM C150, Type I, unless noted otherwise. Use one brand only.

2.4 AGGREGATE

A. Fine aggregate shall conform to ASTM C33.

B. Coarse aggregate of gravel or crushed stone shall conform to ASTM C33, Class 3M. Size coarse aggregate in accordance with ACI 318.

2.5 WATER

A. Water shall be potable and free of deleterious substances in accordance with ACI 318.

2.6 AIR ENTRAINING AGENT

A. Air entraining agent shall conform to ASTM C260.

2.7 WATER REDUCER

A. Water reducing agent shall conform to ASTM C494.

2.8 HIGH-RANGE WATER REDUCER

A. High-range water reducers (superplasticizers) shall conform to ASTM C494.

2.9 CHLORIDE

A. Use no chlorides of any form in concrete.

2.10 CURING COMPOUND

A. An acrylic curing compound meeting the requirements of ASTM C1315 and all local, state and federal Volatile Organic Carbon regulations may be used at the Contractor's option.

2.11 FLY ASH

A. Fly ash shall be Class F fly ash with a loss on ignition of less than five percent or Class C fly ash with a loss on ignition of less than one percent in accordance with ASTM C618.

2.12 ACCELERATORS

A. Non-chloride accelerators shall conform to ASTM C494.

2.13 RETARDERS

A. Retarders shall conform to ASTM C494.

PART 3 - EXECUTION

3.1 HIGH-RANGE WATER REDUCERS

A. High-range water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the high-range water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.

3.2 ADDITION OF WATER AT JOB SITE

A. Provide batch tickets indicating the amount of mix water withheld at the batch plant for each load of concrete delivered. Water may be added to the batch only if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded.

B. Water shall not be added to the batch after the required on-site testing has been performed.

3.3 PLACEMENT OF CONCRETE

A. Deposit concrete as near as practical to final position to prevent segregation of concrete.

B. Do no flowing of concrete with vibrators.

C. Place floors and slabs in accordance with ACI 302.

D. Do not use aluminum equipment in placing and finishing concrete.

E. Place thickened slabs for partitions integral with floor slabs.

F. Prepare place of deposit, mix, convey, place, and cure concrete in accordance with ACI 301, ACI 304, and ACI 318. Wet forms before placing concrete.

3.4 TIME LIMIT

A. Deposit concrete within one and one-half hours after batching.

3.5 VIBRATION

A. Consolidate concrete in accordance with ACI 301 and ACI 309.

3.6 CURING

A. Begin curing procedures immediately following the commencement of the finishing operation.

B. Cure concrete in accordance with ACI 308. Keep the concrete surface moist. If an acrylic curing compound is used, apply in accordance with manufacturer's recommendations to surfaces of concrete not protected for five days by formwork. Do not use curing compounds in areas to receive material that does not adhere to concrete cured with a curing compound unless the curing compound is water soluble.

3.7 ENVIRONMENTAL PROVISIONS

A. Perform cold weather concreting in accordance with ACI 306.

B. Perform hot weather concreting in accordance with ACI 305.

C. Protect concrete from drying and excessive temperature for the first seven days.

D. Protect fresh concrete from wind.

3.9 CONTRACTION JOINTS

A. Obtain Design Professional's approval for location of contraction joints.

B. Place contraction joints in slabs-on-grade as indicated on the Drawings. Where not indicated place contraction joints in slabs-on-grade with a maximum spacing of 48 times the slab thickness to form a regular grid. The long dimension of the grid shall not exceed 1.5 times the short dimension of the grid. Contraction joints may be saw cut if cut within 24 hours after placement of concrete. Saw cuts shall be a depth equal to one-fourth the slab thickness by one-eighth inch wide. Alternately, in areas to receive carpeting or wood flooring contraction joints may be provided by preformed plastic strip inserts.

C. Provide contraction joints in concrete foundation or retaining walls at a maximum spacing of 20-foot but not more than 1.5 or less than 0.7 times the wall height. Space contraction joints equally between column interruptions in the wall surface such as pedestals, corners, or construction joints. Coordinate location with Architect. Contraction joints shall be formed as a **V**-groove on both faces of the wall, 3/4-inch minimum depth.

3.10 CUTTING CONCRETE

A. Obtain Design Professional's written approval prior to cutting concrete for installation of other work.

3.11 PATCHWORK AND REPAIRS

A. Notify Design Professional of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over two inches in diameter to solid concrete, but not less than a depth of one inch. Make edges of cuts perpendicular to the concrete surface.

3.12 CONCRETE FINISHES

A. Finish concrete in accordance with ACI 301.

B. Finish concrete slabs to flatness and levelness tolerances which correspond to F_F 25/F_L 20 minimum overall for composite of all measured values and F_F 17/F_L 12 minimum for any individual floor section.

C. Slabs, which do not meet the flatness and levelness criteria shall be repaired or replaced.

END OF SECTION 033000

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SECTION 036200 - NON-SHRINK GROUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes non-shrink grout under base plates, bearing plates, and where specified in Contract Documents.

1.2 RELATED SECTIONS

A. Section 014525 - Structural Testing/Inspection Agency Services.

1.3 REFERENCES

A. CRD C621 - Specification for Non-Shrink Grout.

B. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

1.4 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Perform compressive strength tests in accordance with ASTM C109 with 2-inch x 2-inch cubes. Test one cube at three days, two cubes at seven days and three cubes at 28 days. Perform one test for each ten bags of grout used or one test in accordance with day of grouting.

1.5 SUBMITTALS

A. Submit product data sheets for review.

PART 2 - PRODUCTS

2.1 GROUT

A. Provide a non-shrink, non-metallic grout that complies with Corps of Engineers Specification CRD-C-621.

B. Grout shall have a minimum compressive strength of 5000 psi at 28 days.

2.2 WATER

A. Provide clean, potable water.

PART 3 - EXECUTION

3.1 HANDLING

A. Store and protect non-shrink grout from moisture and contamination.

3.2 PREPARATION

A. Remove mud, dirt and other foreign materials from areas to be grouted.

3.3 MIXING

A. Mix grout to its fluid, self-leveling consistency in accordance with manufacturers recommendations. Do not retemper grout. Do not exceed manufacturer's maximum limit on water content or use at a consistency which produces free bleeding. Mix grout in a paddle-type mortar mixer. Do not mix by hand.

3.4 PLACEMENT

A. Consolidate grout to provide uniformity. Do not vibrate grout.

B. Use forms to contain grout.

3.5 PROTECTION

A. Protect grout and areas to be grouted from excessive heat and cold in accordance with manufacturer's specifications. Protect grout from excessive drying shrinkage resulting from wind or direct sunlight. Protect areas grouted from excessive vibrations for three days.

END OF SECTION 036200

SECTION 042300 –MANUFACTURED STONE MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Manufactured stone masonry units.

1.2 RELATED SECTIONS

.1 Section 04 26 13 – Masonry Veneer

.10 Section 07 92 00 – Joint Sealants.

1.3 SAMPLES

.1 Samples for Verification: For each product type and color.

1.4 TEST REPORTS

.1 Submit test reports as specified in Section 04 26 13 “Masonry Veneer”.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver manufactured stone masonry units in protective film. Prevent damage to units.

.2 Lift skids with proper and sufficiently long slings or forks with protection to prevent damage to units. Protect edges and corners.

.3 Store units in a manner designed to prevent damage and staining of units.

.4 Stack units on timbers or platforms at least 75 mm above grade.

.5 Place polyethylene or other plastic film between wood and other finished surfaces of units when stored for extended periods of time.

.6 Cover stored units with protective enclosure if exposed to weather.

.7 Do not use salt or calcium-chloride to remove ice from masonry surfaces.

2 PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 Manufacturers of manufactured stone masonry units having Products considered acceptable for use:

.1 Arriscraft
.2 Echelon
.3 Renaissance

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Manufactured Stone Masonry Units: to ASTM C73, Grade SW; solid units that have been pressure formed and autoclaved; 3-5/8" (90 mm) bed depth; special shapes as indicated; and as follows:

.1 Basis of Design: -
.3 Color: as selected by Architect.

.2 Mortar: As specified in Section 04 26 13 "Masonry Veneer".

.3 Wall Ties and Anchorages: as specified in Section 04 26 13 "Masonry Veneer".

.4 Joint Sealants and Backer Rods: non-staining type, as specified in Section 07 92 00 "Joint Sealants".

.5 Flashing, Vents, and Masonry Accessories: as specified in Section 04 26 13 "Masonry Veneer".

2.3 FABRICATION TOLERANCES

.1 Fabricate manufactured stone masonry units to the following tolerances:
.1 Unit Length: plus or minus 1.5 mm.
.2 Unit Height: plus or minus 1.5 mm.
.3 Deviation From Square: plus or minus 1.5 mm, with measurement taken using the longest edge as the base.
.4 Bed Depth: plus or minus 3 mm.
.5 Custom Unit Dimensions: plus or minus 3 mm.

3 PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify site conditions are ready to receive work.

.2 Inspect materials for fit and finish prior to installation. Do not set unacceptable units.

.3 Beginning of installation means acceptance of existing conditions.

3.2 CUTTING MASONRY UNITS

.1 Cut masonry units with wet-saw.

.2 Pre-soak units using clean water prior to cutting.

.3 Clean cut units using a stiff fibre brush and clean water. Allow units to surface dry prior to placement.

.4 Finish cut edges to match face when exposed in wall.

3.3 WETTING MASONRY UNITS

.1 Where the ambient air temperature exceeds 38°C or exceeds 32°C with a wind velocity greater than 13 km/h, pre-wet masonry units.

.2 Lay wetted units when surface dry.

3.4 COURSING

.1 Place masonry to lines and levels indicated.

.2 Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

.3 Lay masonry units in stack bond.

.5 Maintain mortar joint thickness of 3/8 inch (10 mm).

.6 Tool mortar joints by compacting the surface when thumbprint hard, to a slightly concave finish.

3.5 PLACING AND BONDING

.1 Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, deep or excessive furrowing of mortar joints are not permitted.

.2 Fully bond intersections, and external corners.

.3 Do not adjust masonry units after laying. Where resetting of masonry is required, remove, clean units and reset in new mortar.

.4 Install lintels as scheduled.

.5 Install wall ties and anchorages as specified in Section 04 26 13 "Masonry Veneer".

.6 Install flashings, vents, and masonry accessories as specified in Section 04 26 13 "Masonry Veneer".

.7 Construct movement joints as specified in Section 04 26 13 "Masonry Veneer".

3.6 SITE TOLERANCES

.1 Conform to standard tolerances for unit masonry of CSA A371.

3.7 ADJUSTING AND CLEANING

.1 Repair chips on smooth finished units with patch kits furnished by manufacturer.

.2 Clean masonry units as specified in Section 04 26 13 "Masonry Veneer".

.2 Clean one-half of mock-up panel as directed below and leave for one week. If no harmful effects appear, all objectionable stains removed and after mortar has set and cured, clean masonry as follows:

.1 Protect windows, sills, doors, trim and other work from damage.
.2 Remove large particles with stiff fibre brushes without damaging surface.
.3 Saturate masonry with clean water and flush off loose mortar and dirt.
.4 Dilute cleaning agent with clean water in controlled proportions.
.5 Apply solution to pre-soaked wall surface using soft-bristled brush.
.6 Thoroughly rinse cleaning solution and residue from wall surface.

.3 Use alternative cleaning solutions and methods for difficult to clean masonry only after consultation with masonry unit manufacturer.

3.8 PROTECTION

.1 Protect units from damage resulting from subsequent construction operations.

.2 Use protection materials and methods which will not stain or damage units.

.3 Remove protection materials upon Substantial Performance of the Work, or when risk of damage is no longer present.

END OF SECTION

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SECTION 042613 - MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building (common) brick in cavity walls.
2. Mortar and grout.
3. Ties and anchors.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in masonry veneer.
2. Steel lintels in masonry veneer.
3. Steel shelf angles for supporting masonry veneer.

C. Related Requirements:

1. Section 042300 “Calcium Silicate Masonry Units”
2. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
3. Proposed Control Joint locations in plan and elevation.

C. Samples for Verification: For each type and color of the following:

1. Clay face brick.
2. Stone trim.
3. Pigmented mortar.

1.4 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type and size of the following:

1. Masonry units.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down face of veneer, and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

2.3 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Basis of Design: Santa Fe (040) Modular Cushwa Brick by Redland Brick
2. Grade: SW.
3. Type: FBS
4. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long
5. Application: Use where brick is exposed unless otherwise indicated.
6. Color and Texture: As selected by Architect.

2.4 MORTAR MATERIALS

A. Masonry Cement: ASTM C 91/C 91M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cemex S.A.B. de C.V.
    b. Essroc.
    c. Holcim (US) Inc.
    d. Lafarge North America Inc.

B. Colored Cement Products: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Masonry Cement:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Cemex S.A.B. de C.V.
2) Essroc.
3) Holcim (US) Inc.
4) Lafarge North America Inc.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 5 percent of masonry cement by weight.

C. Water: Potable.

2.5 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.060-inch- (1.52-mm-) thick, steel sheet, galvanized after fabrication.

D. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
2. Fabricate sheet metal anchor sections and other sheet metal parts from [0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) FERO Corporation.
2) Hohmann & Barnard, Inc.

6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Heckmann Building Products, Inc.
2) Hohmann & Barnard, Inc.

7. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch (16 mm) wide by 3-5/8 inches (92 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Heckmann Building Products, Inc.
2) Hohmann & Barnard, Inc.

2.6 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch (0.76 mm).

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Carlisle Coatings & Waterproofing Inc.
2) Fiberweb, Clark Hammerbeam Corp.
3) Heckmann Building Products, Inc.
4) Hohmann & Barnard, Inc.
5) Polyguard Products, Inc.
6) W.R. Meadows, Inc.
7) Williams Products, Inc.

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
   1) Self-adhesive flashing using butyl rubber is more expensive than that made with rubberized asphalt and must not be used in contact with asphalt; however, it is more adhesive than rubberized asphalt at cold temperatures and does not soften and run as readily at high temperatures.

2. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch (0.76 mm).

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) DuPont Safety & Construction.
      2) GCP Applied Technologies Inc.
      3) Protecto Wrap Company.

   b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

3. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) DuPont.
      2) Hohmann & Barnard, Inc.
      3) Hyload, Inc.
      4) Mortar Net Solutions.

   b. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch (1.02 mm) thick.
   c. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of adhesive.

   d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Weep/Vent Products: Use one of the following unless otherwise indicated:
   1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

         1) Advanced Building Products Inc.
         2) Heckmann Building Products, Inc.
         3) Hohmann & Barnard, Inc.

   2. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.

      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

         1) Hohmann & Barnard, Inc.
         2) Williams Products, Inc.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
      b. EaCo Chem, Inc.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

   1. Do not use calcium chloride in mortar or grout.
   2. Use masonry cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Pigmented Mortar: Use colored cement product.

1. Application: Use pigmented mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

3.5 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

B. Provide not less than 2 inches (50 mm) of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 EXPANSION JOINTS

A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints as follows:

1. Build in compressible joint fillers where indicated.
2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.8 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.9 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under water-resistive barrier, lapping at least 4 inches (100 mm).
3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 042613

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SECTION 04 72 00 - CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following:
1. Architectural cast concrete wall veneer and concrete castings, referred to on drawings as "cast stone" or "architectural cast stone."
3. Anchorage devices required for securement of cast stone fabrications.

B. Related sections - The following sections contain requirements that relate to this section:
1. Section 01 91 00 "Commissioning Requirements" for building envelope commissioning requirements.
2. Division 04 Section "Masonry Veneer" for brick veneer, mortar, and thru-wall flashings.
3. Section 07 08 00 "Commissioning of Thermal and Moisture Protection" for building envelope commissioning requirements.
4. Division 07 Section "Fluid-Applied Membrane Air Barrier" for exterior wall primary water and air resistive barrier and related opening/penetration flashings.
5. Division 07 Section "Thermal and Sound Attenuation Insulation" for continuous exterior wall insulation.
6. Division 07 Section "Joint Sealants" for elastomeric joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. Provide cast stone system, including anchorage, capable of withstanding the effects of the following structural loads
1. Wind Loads: As indicated on Drawings.
2. Seismic Loads: As indicated on Drawings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Submit samples for each type of product indicated.

C. Shop Drawings: Indicate sizes, shapes, fabrication, and installation details for all fabricated items. Indicate anchorage to adjacent surfaces.

D. Evidence of compliance with structural requirements including anchorage devices as applicable.

E. Submit maintenance instructions as close-out documents.

F. Qualification Data: For manufacturer.

G. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

A. Installer: Engage an experienced installer who has completed cast stone projects similar in material, design and extend to that indicated for this project and with a three (3) year minimum record of successful in-service performance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in undamaged condition.

B. Store and handle cast stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.

C. Store cementitious materials off the ground, undercover, and in a dry location.

D. Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.

1.07 PROJECT CONDITIONS

A. Protection of cast stone: During erection, cover tops of walls, projections, and sills with waterproof sheathing at the end of each day's work.

B. Stain prevention: Immediately remove grout, mortar, and soil to prevent them from staining the face of cast stone.
1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
2. Protect sills, ledges and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed cast stone.

C. Environmental Requirements:
1. Laying masonry when temperature of surrounding air has dropped below 45 degrees F, unless temperature is rising, and at no time when temperature has dropped below 40 degrees F is prohibited, except by written permission from Architect.
2. Cold weather precautions:
   a. Authorized masonry Work during temperatures below 40 degrees F, but above freezing: provide and maintain mortar at temperature between 40 degrees F and 120 degrees F until placed.
   b. Maintain air temperature above 40 degrees F on both sides of masonry for at least 72 hours after laying.
   c. Use windbreaks to protect masonry construction from direct exposure to winds in excess of 15 MPH when constructed in temperatures below 32

degrees F.
d. Do not build on frozen setting beds.
e. Remove and replace cast stone damaged by frost or freezing conditions.

3. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperatures 95 degrees F and above in the shade with relative humidity less than 50%.

PART 2 - PRODUCTS

2.01 ARCHITECTURAL CAST STONE

A. Basis of Design: Cast Stone as manufactured by Arriscraft USA.

B. Acceptable Manufacturers: Products of the following manufacturers comparable in type and quality are acceptable:
1. Southern Castings Inc., Valdosta, Georgia, http://southerncastings.com/.
2. Arriscraft USA, a General Shale Company, Georgia, www.arriscraft.com.
3. Centurion Products, Inc., Tennessee, www.centurionstone.com.
4. Coronado Products, Inc., corporate headquarters California, www.coronadostone.com.
5. Eldorado Stone Corporation, corporate headquarters California, www.eldoradostone.com.
6. Italian Cast Stone, Florida, www.italiancaststone.com.
7. K&T Stoneworks, Inc., Florida, www.ktstoneworks.com.

2.02 MATERIALS

A. Cast stone to be selected by Architect from manufacturer's standard types and colors.

B. Quality: Meeting ASTM ~~C216~~ C 1364.

C. Composition of Material: Cast stone produced from expanded aggregate, Portland Type I Cement with silicone coated perlite and additives which will meet or exceed the following:
1. Absorption: 12.6% ASTM C140-08 as a standard.
2. Compressive Strength: PSI 3,540 ASTM C67-08.
3. Thermal Conductivity: K-Factor 4.033 ASTM C177-04, R-Factor, 44.

D. Provide cast stone trim castings and profiles:
1. As indicated on drawings.

E. Mortar:
1. Portland Cement; ASTM C150-07, Type 1 or masonry cement (Type N), ASTM C91-01.
2. Other requirements as indicated in Division 04 Section "Masonry Veneer."

F. Masonry cleaning compound: Refer to Specification Section 040110 Masonry Cleaning.

G. Anchorage Devices: Manufacturer's standard non-corrosive devices for application indicated.

2.03 FINISH

A. Color and Texture: As selected by Architect from manufacturer's full range of colors and textures, including premium finishes as may be applicable.

PART 3 - EXECUTION

3.1 MORTAR

A. Refer to Division 04 Section "Masonry Veneer."

3.2 APPLICATION

A. Apply in accordance with manufacturer's installation instructions.

B. Place units with uniform mortar joints. Stone joints should not be over 1/2 inches in width.
1. Provide sealant at joints, in lieu of mortar, as directed by manufacturers written instructions.
2. Secure with anchorage devices as indicated on approved shop drawings.

C. Plan work to minimize job site cutting. Perform necessary cutting with proper tools to provide uniform edges; take care to prevent breaking unit corners or edges.

D. Remove excess mortar; do not allow mortar to set-up on face of units. Point and tool joints before mortar has set. Thoroughly clean stone surface by brooming or brushing to remove loose mortar and to clean the face of the stone. The stone face may be cleaned by a light washing. Do not use acid or acid based cleaners in cleaning of stone.

E. Workmanship:
1. Installing cracked, broken, or chipped units exceeding ASTM allowances is prohibited.
2. Use abrasive power saws to cut CSM. Avoid slivers less than 2 in. wide.
3. Lay CSM plumb, true to line, and with level courses; space within allowable tolerances.
4. Furrowing bed joints is prohibited.
5. Stop off horizontal run by racking back in each course; toothing is prohibited.
6. Adjust units to final position while mortar is soft and plastic.
7. Units displaced after mortar has stiffened: Remove, clean joints and units of mortar; relay with fresh mortar.
8. Cut and patch finish masonry to accommodate Work of other trades without marring finished surface appearance.
9. Mix units from pallets in Work to diminish noticeable variation in color and texture between pallets.
10. When joining fresh masonry to set or partially set masonry, remove loose CSM and mortar; clean and dampen exposed surface of set masonry prior to laying fresh masonry.

F. Control Joints:
1. Keep clean of mortar and debris. Make joints 3/4 in wide.
2. Space control joints as indicated.
3. Coordinate location of control joints in CSM work with control joints in concrete unit masonry backup.

G. Wall Cavities: Keep wall cavity clear of mortar and debris as the work progresses.

H. Flashing:
   1. Clean masonry surfaces smooth; maintain free from projections capable of puncturing flashing material.
   2. Place through-wall flashing as specified in Division 07 Section "Fluid-Applied Membrane Air Barrier" on bed of mortar; cover with mortar.

I. Sealant Joints: Retain 1/2 in. deep by 1/4 in. wide sealant joint around outside perimeter of exterior doors, window frames, and other wall openings.

J. Pointing: Cut out defective mortar joints and holes in exposed Work. Repoint with new mortar.

K. Dry Cleaning: Brush CSM surfaces with stiff bristle brush. Do not allow mortar droppings to harden on exposed surfaces.

L. General:
   1. Remove stains in accord with recommendations of Brick Institute of America, Technical Notes #20 June 2006. Use cleaning agents only after pre-testing on sample panel.
   2. Test panel:
      a. Apply solution on half of surface of mock-up panel at least 21 days prior to application of cleaning solution to CSM work.
      b. Should discoloration of CSM or mortar joints, staining, or efflorescence appear on sample panel, notify manufacturer in writing; await further instructions.
   3. Wet cleaning within seven days of placing masonry is prohibited.

M. Preparatory Work:
   1. Protect materials adjacent to brick Work subject to corrosion from contact with cleaning solution.
   2. Saturate mortar joints with clean water; flush off loose debris at least two hours prior to cleaning solution application to CSM.

N. Cleaning:
   1. Apply cleaning solution on CSM unit masonry as tested on mock-up panel in accord with manufacturer's product data; flush with clean water.
   2. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft. maximum. Flush wall as cleaning progresses to prevent accumulation of scum.
   3. Scrubbing mortar joints with cleaning solution is prohibited.

O. Safely discard solutions containing debris and residue.

END OF SECTION 04 72 10

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Miscellaneous steel trim
5. Metal downspout boots

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Loose steel lintels.

C. Samples for Verification: For each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

C. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
2. Material: Galvanized steel, ASTM A653/A653M, with G90 (Z275) coating.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum, stainless steel, or nickel silver.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

G. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.6 METAL DOWNSPOUT BOOTS

A. Source Limitations: Obtain downspout boots from single source from single manufacturer.

B. Provide downspout boots made from cast aluminum in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

1. Outlet: Vertical, to discharge into pipe

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

2.9 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes wood framing and sheathing to form the superstructure of a wood framed building as indicated on the Drawings.

1.2 RELATED SECTIONS

A. Section 013330 - Structural Submittals.

B. Section 014525 - Structural Testing/Inspection Agency Services.

C. Section 061753 - Fabricated Wood Trusses.

1.3 REFERENCES

A. AFPA (American Forest and Paper Association) - National Design Specification for Wood Construction.

B. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

C. ANSI A208.1 - Mat-Formed Wood Particleboard.

D. ANSI/AHA A135.4 - Basic Hardboard.

E. APA: American Plywood Association.

F. AWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

G. AWPA C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.

H. RIS: Redwood Inspection Service.

I. SPIB: Southern Pine Inspection Bureau.

J. WCLIB: West Coast Lumber Inspection Bureau.

K. WWPA: Western Wood Products Association.

1.4 DEFINITIONS

A. Structural Panel is a panel product composed primarily of wood and meeting the requirements of United States Voluntary Product Standard PS 2-92. Performance Standard for Wood-Based Structural-Use Panels". Structural panels include all-veneer plywood, composite panels containing a combination of veneer and wood-based material, and malformed panels such as oriented strand board and waferboard.

1.5 SUBMITTALS

A. For treated materials, submit certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.

1.6 QUALITY ASSURANCE

A. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required by Specification 01 4525.

B. Comply with National Design Specification For Wood Construction.

C. Perform work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.

2. Plywood Grading Agency: Certified by APA.

D. Identify all structural panels by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.

2. Structural Panel: Panel grade, span rating, exposure durability classification, product standard thickness, and mill number.

1.7 REQUIREMENTS OF REGULATORY AGENCIES

A. Pressure treated material - American Wood Preservers Bureau Standards.

B. Span tables - National Forest Products Association.

C. Working stresses - Softwood Lumber, National Design Specification, National Forest Products Association.

1.8 PROTECTION

A. Deliver, store, and handle all materials in such a manner to protect against damage and the weather.

B. Use all means necessary to protect the installed work and materials of all other trades.

1.9 REPLACEMENTS

A. In the advent of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 LUMBER

A. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual size as required by PS 20, for moisture content specified for each use.

B. Provide dressed lumber, S4S, unless otherwise indicated.

C. Provide seasoned lumber No. 2, Southern Pine with 15% maximum moisture content at time of dressing unless noted otherwise on the Drawings.

D. Lumber Grading Rules and Wood Species to be in conformance with Voluntary Product Standard PS 20: Grading rules of the following associations apply to materials furnished under this section:

1. Northeastern Lumber Manufacturer's Association, Inc. (NELMA).

2. Southern Pine Inspection Bureau (SPIB).

3. West Coast Lumber Inspection Bureau (WCLIB).

4. West Wood Products Association (WWPA).

2.2 PARALLEL STRAND LUMBER

A. Provide Parallel Strand Lumber (PSL) as specified on Drawings as manufactured by Trus Joist MacMillan.

2.3 FASTENERS AND ANCHORAGES

A. Provide size and type as indicated and as recommended by National Forest Products Association "National Design Specification for Stress-Grade Lumber and Its Fastings" complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.

B. Use galvanized fasteners with pressure treated lumber or high humidity conditions, unfinished steel elsewhere.

2.4 PRESERVATIVE TREATMENT

A. Where lumber or structural panel is indicated as "treated", or is specified herein to be treated, comply with the applicable requirements of the AWPB. Mark each treated item with the AWPB Quality Mark requirements.

B. Pressure-treat above-ground items with water-borne preservatives complying with AWPB LP-2. Treat indicated items and the following:

1. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

C. Complete fabrication of treated items prior to treatment, wherever possible. If cut after treatment, apply one coat of same chemical used for treatment in accordance with manufacturer's instructions.

D. Allow preservative to dry prior to erecting members. Inspect each piece of lumber or structural panel after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 GENERAL

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Discard unit of material with defects which might impair quality of work, and units which are too small to fabricate work with minimum joints or optimum joint arrangement.

D. Installer must examine the substrate structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

E. Coordinate carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

3.2 STRUCTURAL PANELS

A. Secure roof sheathing perpendicular to framing member with ends staggered and sheet ends over firm bearing. Provide solid edge blocking between sheets. Secure to wood framing with nails of size and spacing shown on Drawings.

B. Secure wall sheathing with long dimension parallel to wall studs, with ends over firm bearing. Provide solid blocking at ends of sheets. Secure to wood framing with nails of size and spacing shown on Drawings.

3.3 WOOD GROUND, NAILERS, BLOCKING AND SLEEPERS

A. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrate as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" (38mm) wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.4 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

3.5 MISCELLANEOUS FRAMING

A. Firestops:

1. Stud walls: Two inches thick by depth of member blocking at each floor level, top story ceiling level, and soffits as required.

2. Floor and ceiling framing: Two inches thick by depth of wood member blocking, fitted to fill openings from one space to another to prevent drafts.

B. Framing for mechanical work:

1. Frame members for passage of pipes and ducts to avoid cutting structural members.

2. Reinforce framing members where damaged by cutting.

C. Blocking: Locate blocking to facilitate installation of finish materials, casework, fixtures, specialty items and trim railings.

END OF SECTION 061000

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SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking and nailers.
4. Wood furring.
5. Wood sleepers.
6. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
2. Section 061753 "Fabricated Wood Trusses" for wood trusses made from dimension lumber.
3. Section 313116 "Termite Control" for site application of borate treatment to wood framing.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include

physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness or less unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, [mark end or back of each piece] [or] [omit marking and provide certificates of treatment compliance issued by inspection agency].

D. Application: Treat all miscellaneous carpentry unless otherwise indicated, items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Northern species; NLGA.
7. Eastern softwoods; NeLMA.
8. Western woods; WCLIB or WWPA.

B. Other Framing: Construction or No. 2 grade of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Southern pine or mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Screws for Fastening to Metal Framing: ASTM C1002 ASTM C954, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4).

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A666, Type 304 Type 316.

1. Use for exterior locations and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

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SECTION 061300 - HEAVY TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

A. Structural design, fabrication and installation of heavy timber beams, columns, solid decking, & trusses.

B. Perform all work required to properly complete the heavy timber work as shown on the drawings and as specified herein. Include any and all modifications to the design that are structurally required under 1.3C of this section.

C. Provide all labor, materials, staging, scaffolding, temporary bracing, crane, hoists, rigging, equipment, and services necessary to perform the Work of this Section. The work includes, but is not necessarily limited to the following:

1. Timber components of every description, including beams, girts, plates, braces, ties, pegs, webs.

2. Miscellaneous hardware for heavy timber construction, including but not limited to: Plate connectors and bolts.

1.2 RELATED WORK

A. Section 061000 – Rough Carpentry

1.3 SUBMITTALS

A. Shop Drawings: Submit for review shop drawings signed and sealed by a Structural Engineer registered in state where project is located. Show design loads, material properties, full dimensions of each member, and layout of timber frame system. Show large-scale details of joints and connections. Provide hardware cut sheets and design values for fasteners.

B. Submit under provisions of Section 013300.

C. Submit representative samples of wood species indicated, of the grade and finish specified, for Architect's approval.

D. Shop Drawings: Furnish complete Shop Drawings in accordance with the provisions of Section 013330. Shop Drawings shall include the following:

1. Small scale plans and elevations showing all truss members, joints and methods of assembly. Shop Drawings shall include details for every member and connection and shall show connector plates, pegs, mortises, tenons, lengths, angles of cut, etc.

1.4 PROTECTION, STORAGE AND HANDLING

A. Schedule timber delivery and installation to avoid extended on-site storage.

B. Protect trusses and keep dry in transit and at the job site.

C. Stack to ensure proper ventilation and drainage.

D. Store under cover in a well-ventilated area.

E. Trusses damaged in shipment or at the job site shall be repaired or replaced at no cost to the Owner.

1.5 QUALITY ASSURANCE

A. Fabricator and Erector of timber framing shall not have less than 5 years' experience in fabrication and erection of timber framing.

B. Timbers shall be graded by lumber grading agency certified by American Lumber Standards Committee.

C. Locate grade stamp on timber surfaces not exposed to view in completed work. Grade certification can be submitted in lieu of grade stamping material.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with PS 20 and grading rules of lumber grading agencies certified by American Lumber Standards Committee Board of Review as applicable.

1. Factory mark each item of timber with grade stamp of grading agency.

2. For exposed timber indicated to receive stained or natural finish, apply grade stamps to surfaces not exposed to view, or omit grade stamps and provide certificates of grade compliance issued by grading agency.

B. Preservative Treatment:

1. For sawn products, pressure treat timbers as required in architectural and structural drawings and within this section with preservative treatment to comply with AWPA U1-04 Use Category System, Commodity Specification A, Sawn Products.

a. List products to be treated.
b. Products to be treated after fabrication.
c. Specify conditioning (air dry, kiln dry, etc.), packaging, and handling after treating.
d. Specify treatment for post-treating fabrication.

2. For posts, pressure treat poles as required in architectural and structural drawings and this section with preservative treatment to comply with AWPA U1-04 Use Category System, Commodity Specification B, Posts.

    a. List products to be treated.
    b. Products to be treated after fabrication.
    c. Specify conditioning (air dry, kiln dry, etc.), packaging, and handling after treating.
    d. Specify treatment for post-treating fabrication.

3. For fire-retardant timber, pressure treat material as required in architectural and structural drawings and this section with treatment to comply with AWPA U1-04 Use Category System, Commodity Specification H, Fire Retardants.

2.2 TIMBER

A. Timber species shall be #1 & Better Southern Pine.

B. Timber performance requirements. Species and grade that comply with required structural properties for moisture content provided.

1. Allowable Stress Ratings for Timber shall be per latest NDS.

C. Grading Rules: NELMA, NHLA, NLGA, SPIB, WCLIB, or WWPA.

D. For large (10-inch or greater maximum dimension) members, use box heart timbers. For small (less than 10-inch maximum dimension) members, use free of heart center timbers. Do not use timber with excessive reaction wood.

E. Moisture Content: Provide timber 19 percent maximum moisture content at time of fabrication and installation.

F. Dressing: Provide timber that is rough sawn unless otherwise indicated.

G. Incising: To be performed by timber supplier.

H. End Sealer: Manufacturer's standard, transparent, colorless wood sealer effective in retarding transmission of moisture at cross-grain cuts and compatible with finish.

I. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer compatible with finish.

J. Cut members indicated as curved in drawings from stock having similar natural curves. Cross grain deviation greater than 1 in 10 is not permitted unless member is identified in the drawings as decorative only.

2.3 FASTENERS AND MISCELLANEOUS HARDWARE

A. General: Provide fasteners of size and type complying with requirements specified for material and manufacture.

1. Where fasteners are exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide hot-dip galvanized.

B. Wood Screws: ASME B18.6.1.

C. Lag Bolts: ASME B18.2.1.

D. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

E. Threaded Rods: ASTM A 36.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing in accordance ASTM E 488, performed by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.4 STEEL CONNECTION MATERIALS

A. Unless otherwise indicated, fabricate steel connection materials and steel elements from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36.

2. Round steel bars complying with ASTM A 575, Grade M 1020.

3. Hot-rolled steel sheet complying with ASTM A 1011, Structural Steel, Type SS, Grade 33.

4. Stainless steel plate and flat bars complying with ASTM A 666, Type 304.

5. Stainless steel bars and shapes complying with ASTM A 276, Type 304.

6. Stainless steel sheet complying with ASTM A 666, Type 304.

B. Finish:

1. Where not exposed to weather, finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

2. Where exposed to weather, hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.5 FABRICATION

A. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Predrill for fasteners and assembly of units.

1. Finish exposed surfaces to provide smooth finish. Surface texture shall be equivalent to that produced by machine sanding with No. 120 grit sandpaper.

2. Where preservative-treated members are specified, fabricate before treatment to greatest extent possible. Where fabrication must be done after treatment, apply field-treatment preservative to comply with AWPA M4.

a. Use inorganic boron treatment for members not in contact with ground and continuously protected from water.
b. Use copper naphthenate treatment for members in contact with ground or not continuously protected from water.

B. Camber: Fabricate horizontal members and inclined members with slope of less than 1:1 with natural convex bow (crown) up to provide camber.

C. Seal Coat: After fabricating and surfacing each unit, apply saturation coat of penetrating sealer on surfaces of each unit except for treated wood where treatment included water repellent.

D. Timber sizes are nominal dimensions at the time of fabrication. Plane, adze, or otherwise dress timber to square, uniform dimension at joinery locations. Dressed dimensions shall not be more than 1/4 inch under size indicated in drawings.

E. Waney edges are not permitted.

F. Timbers with moderate bow are permitted where their intended use will straighten them. Place crowns up for spanning members. Do not use severely bowed timbers or timbers bowed in more than one direction.

G. Remove staining from soil, oil, or grease.

H. Chamfer exposed edges of beams and posts with ski tip stops.

I. Cut mortise and tenon joints so there is 1/4-inch-minimum clearance between tendon end and mortise bottom to allow for shrinkage.

J. Cut 1/4-inch chamfers on tenons on end grain edges.

K. Cut joints accurately to make neat, snug fit.

L. Layout marks and identification marks shall not be visible on completed frame.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

A. General: Erect heavy timber construction true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

B. Handle and temporarily support heavy timber construction to prevent surface damage, compression, and other effects that might interfere with indicated finish. Tools used to drive or pull joints together shall not mar finished surface of timber.

C. Framing adjacent to masonry: Provide 1/2-inch clearance at tops, sides, and ends of members adjacent to masonry unless otherwise indicated.

D. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with finish and preservative treatment requirements for shop fabrication.

3.2 STRUCTURAL TESTS AND INSPECTIONS

A. Notify Special Inspector when structural framing is complete. Timber framing shall be inspected and approved prior to enclosing roofs.

3.3 ADJUSTING AND CLEANING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber construction if repairs are not approved by Architect.

END OF SECTION 061300

SECTION 061519 - WOOD DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Softwood lumber structural wood decking.

1.2 RELATED SECTIONS

A. Section 014525 - Structural Testing/Inspection Agency Services.

B. Section 061000 - Rough Carpentry

1.3 REFERENCES

A. PS20-American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1999.

B. SPIB (GR) – Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

1.4 SYSTEM DESCRIPTION

A. Design roof live and dead load: As indicated on structural drawings with deflection limited to 1/240 of span.

1.5 SUBMITTALS

A. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.

B. Samples of Wood Deck Exposed To View: Submit samples, 12 inch long in size illustrating wood grain, stain, and finish.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. Lumber: PS 20 and approved grading rules and inspection agencies.

PART 2 – PRODUCTS

2.1 SOLID WOOD DECKING

A. Lumber Decking.

B. Species: Southern Pine.

C. Grade: Select Decking.

D. Moisture Content: 15 percent maximum moisture content.

E. Pattern and Dressing: beveled edges, single tongue, surfaced 2 sides.

F. Size: nominal 2 x 6, actual 1 ½ inches x 5 ½ inches.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that support framing is ready to receive decking.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 INSTALLATION – LUMBER DECKING

A. Install decking at 90 degrees to framing members, with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward. Install decking in a controlled random layout as required by applicable building code.

B. Fit butt end deck joints occurring between support members with metal splines to maintain tight, aligned joints.

C. Engage decking tongue and groove edges.

D. Secure with fasteners.

E. Maintain decking joint space of 1/16 inch maximum.

3.4 TOLERANCES

A. Surface Flatness of Decking Without Load: ¼ inch in 1- feet maximum, and ½ inch in 30 feet maximum.

END OF SECTION 061519

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072726 "Fluid-Applied Membrane Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

1. Nominal Thickness: Not less than 1/2 inch (13 mm).

2.2 ROOF SHEATHING

A. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

1. Nominal Thickness: Not less than 3/4 inch (19 mm).

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

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SECTION 061753 - FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes all work and supplementary items required to complete the proper design, fabrication and erection of the fabricated wood truss system as shown on the Contract Documents and specified herein, including headers, outriggers, supplemental rafters, temporary and permanent bracing, blocking, ridge members, valley members, incidental framing, and connections to the structure for a complete assembly within the extents shown on the Drawings.

B. Fabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.

1.2 RELATED SECTIONS

A. Section 013330 - Structural Submittals.

B. Section 014525 - Structural Testing/Inspection Agency Services.

C. Section 061000 - Rough Carpentry.

D. Section 061300 - Heavy Timber Construction

1.3 REFERENCES

A. AFPA - National Design Specification for Wood Construction.

B. ANSI/TPI 1 – National Design Standard for Metal-Plate-Connected Wood Truss Construction

C. ASTM A446 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

D. ASTM A525 - Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. TPI - Design Specification for Metal Plate Connected Wood Trusses.

G. TPI HIB – Commentary and Recommendations for Handling Installing and Bracing Metal Plate Connected Wood Trusses.

H. TPI DSB – Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses.

I. TPI - Quality Control Manual.

1.4 DESIGN REQUIREMENTS

A. Design of wood trusses, including header truss units at openings or change of framing, is the sole responsibility of the Contractor.

B. Fabricated wood trusses shall be designed by a Structural Engineer licensed in the project state for the loads shown on the Drawings.

C. Design shall comply with the National Design Specification for Wood Construction (NDS) published by American Forest and Paper Association (AFPA), the Design Specifications for Metal Plate Connected Wood Trusses published by the Truss Plate Institute (TPI), and the requirements of the Building Code.

1.5 SUBMITTALS

A. Submit shop drawings (sealed by an engineer licensed in the project state) showing loads, species, sizes and stress grades of lumber to be used; pitch, span camber configuration and spacing for each type of truss required; type, size, material, finish, design value, and location of metal connector plates; bearing and anchorage details; and temporary bracing requirements.

B. Submit fabricator's specification and installation instructions for required work, covering lumber, metal plates, hardware, fabrication process treatment (if any), handling and erection.

C. Submit certification, signed by an officer of fabricating firm, indicating that trusses to be supplied for the project comply with indicated requirements.

D. Submit certification by treating plant that required treatment complies with specified standards, if applicable.

E. Submit certification that the fabricator meets the required qualifications. If fabricator has to have an independent testing agency to inspect fabrication as required by these specifications, submit the name and qualifications of the independent testing agency.

F. For each approved fabricator that is exempt from Special Inspections of shop fabrications and implementation procedures in accordance with Section 1704.2 of the Building Code, submit "Fabricator's Certificate of Compliance". Provide copies of fabricator's certification or building code evaluation services report and fabricator's quality control manual.

1.6 QUALITY ASSURANCE

A. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required by Specification 01 4525.

1.7 FABRICATOR'S QUALIFICATIONS

A. Minimum of three years experience in successful fabrication of trusses comparable to type indicated for this project.

1.8 STORAGE AND HANDLING

A. Handle and store trusses with care and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

PART 2 - PRODUCTS

2.1 LUMBER

A. Lumber used for truss members shall be in accordance with published values of lumber rules writing agencies approved by the board of review of American Lumber Standards Committee. Lumber shall be identified by Grade mark of a lumber inspection bureau or agency approved by the Board, and shall be as shown on the Drawings.

B. Provide seasoned lumber with no less than 7 percent moisture content nor greater than 19 percent moisture content at time of fabrication.

C. Any softwood, at Fabricator's option, as required to comply with loading requirements unless noted otherwise on the Drawings.

2.2 CONNECTOR PLATES

A. Connector plates with National Design Specification for Wood Construction, published by the American Forest and Paper Association and the Design Specification for Metal Plate Connected Wood Trusses, published by the Truss Plate Institute.

B. Connector plates shall have a minimum thickness of 0.036 inch (20 gage).

C. Steel shall conform to ASTM A446, Grade A, and shall be hot-dip galvanized in accordance with ASTM A525, G60, unless noted otherwise.

2.3 FIRE RETARDANT TREATMENT

A. Where "FR-S" lumber for trusses is indicated provide materials which comply with AWPA Standard C20 for pressure impregnation with fire-retardant chemicals, and which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E84, and show no increase in flame spread and significant progressive combustion upon continuation of test for additional 20 minutes.

B. Redry treated lumber to comply with AWPA C20.

C. Provide UL label on each piece of fire-retardant lumber.

D. Inspect each piece of treated lumber after drying and discard damaged or defective pieces.

E. Provide stainless steel connector plates with fire retardant lumber.

PART 3 - EXECUTION

3.1 FABRICATION

A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with proper wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

C. Assemble truss members in design configuration indicated on the structural drawings using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

D. Connect truss members by means of metal connector plates accurately located and securely fastened to wood members by means indicated or approved.

3.2 ERECTION

A. Erect and brace trusses to comply with recommendations of manufacturer and the Truss Plate Institute.

B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

C. Hoist units in place by means of proper lifting equipment suited to sizes and types of trusses required, applied at proper lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

3.3 BRACING

A. Provide erection bracing as required to maintain trusses plumb, parallel and in proper location, until permanent bracing is installed.

B. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with Bracing Wood Trusses Commentary and Recommendations (BWT-76) published by Truss Plate Institute.

3.4 BEARING

A. Anchor trusses securely at all bearing points to comply with methods and details indicated.

3.5 CUTTING

A. Cutting or altering of truss members is not permitted.

END OF SECTION 061753

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Glass-fiber blanket

B. Related Sections include the following:

   1. Section 092900 – "Gypsum Board" for installation in wood framed assemblies and for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Ceiling plenums.
   b. Attic spaces.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Place loose-fill insulation into spaces indicated, either by pouring or by machine blowing, to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

D. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

E. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install 3-inch- (76-mm-) thick, unfaced glass-fiber blanket insulation over ceilings at partitions in a width that extends insulation 48 inches (1219 mm) on either side of partition.

B. Install 1-1/2-inch- (38-mm-) thick, unfaced glass-fiber blanket insulation over ceilings so that insulation extends over entire ceiling.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

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SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vapor-permeable, fluid-applied air barriers for use over wall sheathing board.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Grace Construction Products; W.R. Grace & Co. -- Conn.
2) Henry Company, Sealants Division.
3) Tremco Incorporated.
4) W.R. Meadows, INC.
5) Momentive.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method, Procedure A.
c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 30 lbf/sq. in. (207 kPa) when tested according to ASTM D 4541.
e. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to

produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

D. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

E. Bridge expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip or preformed silicone extrusion so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.
2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing Agency: Architect will engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.

14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers or ASTM E 1186, chamber depressurization using detection liquids.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

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SECTION 074113 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes standing-seam metal roof panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.7 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

PART 2 - PRODUCTS

2.1 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels. Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advanced Architectural Products.
    b. AEP Span; A BlueScope Steel Company.
    c. ATAS International, Inc.
    d. CENTRIA Architectural Systems.
    e. Firestone Building Products.
    f. Morin - A Kingspan Group Company.
    g. Ultra Seam Incorporated.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Nominal Thickness: 0.025 inch (0.635 mm)
    b. Exterior Finish: Thermoplastic fluoropolymer
    c. Color: As selected by Architect from manufacturer's full range.

3. Clips: One-piece fixed to accommodate thermal movement.

    a. Material: 0.025-inch- (0.635-mm) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

4. Joint Type: As standard with manufacturer.
5. Panel Coverage: 16 inches (406 mm)
6. Panel Height: 1.5 inches (38 mm)

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carlisle Residential; a division of Carlisle Construction Materials.
b. Drexel Metals.
c. GCP Applied Technologies Inc.
d. Owens Corning.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch (1.2-mm) thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

G. Panel Fasteners: Self-tapping screws designed to withstand design loads.

H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
5. FEVE Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
6. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
7. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
2. Apply over the roof area indicated below:

    a. Roof perimeter for a distance up from eaves of 24 inches (610 mm) beyond interior wall line.
    b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).
    c. Hips and ridges for a distance on each side of 12 inches (305 mm)
    d. Roof-to-wall intersections for a distance from wall of 18 inches (460 mm)
    e. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm)

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

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SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fiber-cement siding.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
2. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For fiber-cement siding including related accessories.

C. Samples for Verification: For each type, color, texture, and pattern required.

1. 12-inch- (300-mm-) long-by-actual-width Sample of siding.
2. 24-inch- (600-mm-) wide-by-36-inch- (900-mm-) high Sample panel of siding assembled on plywood backing.
3. 12-inch- (300-mm-) long-by-actual-width Samples of trim and accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish full lengths of fiber-cement siding including related accessories, in a quantity equal to 2 percent of amount installed.

1.9 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location. Protect edges and corners from chipping.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 30 years from date of Substantial Completion.

B. Manufacturer's Finish Warranty: 15 years from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING & TRIM

A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less when tested according to ASTM E84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation.
b. GAF.
c. James Hardie Building Products, Inc.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Sheets not less than 5/16 inch (8 mm), batten boards and other trim not less than 3/4 inch (19 mm).

D. Vertical Pattern: 48-inch- (1200-mm-) wide sheets with 2-1/2 inch batten boards spaced 12" o.c.

E. Texture: Wood Grained

F. Exposed Finish: Factory.

G. Factory Finish Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:

1. Corner posts.
2. Door and window casings.
3. Fasciae.
4. Moldings and trim.

C. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

D. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening fiber cement, use stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 3/8 inches (9.5 mm) from panel edges and 2 inches (51mm) from panel corners

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

C. Install batten boards vertically at every fiber-cement panel joint and 12” o.c.

D. Trim:

1. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
2. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25mm) from end. Fasten minimum 16 inches (406mm) on center.
3. Oustide Corner Board: Attach trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (36 mm) apart.

E. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C)].
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Locations:
   a. Joints in exterior insulation and finish systems.
   b. Frames of doors, windows and louvers.
   c. Control and expansion joints in ceilings and other overhead surfaces.
   d. Other joints as indicated on Drawings.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. May National Associates, Inc.; a subsidiary of Sika Corporation.
    b. Pecora Corporation.
    c. Sika Corporation; Joint Sealants.
    d. Tremco Incorporated.

2.3 URETHANE JOINT SEALANTS

A. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

1. Locations:
    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between different materials listed above.
    c. Other joints as indicated on Drawings.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Pecora Corporation.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Locations:
    a. Control joints in tile floors and walls in wet areas.
    b. Between plumbing fixtures and adjacent surfaces.
    c. Other joints as indicated on Drawings.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dow Corning Corporation.
    b. GE Construction Sealants; Momentive Performance Materials Inc.
    c. May National Associates, Inc.; a subsidiary of Sika Corporation.
    d. Pecora Corporation.
    e. Tremco Incorporated.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Locations:
   a. Thresholds and sill plates.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Bostik, Inc.
   b. Pecora Corporation.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Locations:
   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
   c. Other joints as indicated on Drawings.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. May National Associates, Inc.; a subsidiary of Sika Corporation.
   b. Pecora Corporation.
   c. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Adfast.
   b. Alcot Plastics Ltd.
   c. BASF Corp. - Construction Chemicals.
   d. Construction Foam Products; a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Interior custom hollow-metal doors and frames.
   2. Exterior custom hollow-metal doors and frames.

B. Related Requirements:
   1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Apex Industries, Inc.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.
4. Custom Metal Products.
5. Gensteel Doors, Inc.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to Georgia State Fire Marshall for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Standard-Duty Frames: SDI A250.8, Level 1; SDI A250.4, Level C.

1. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Slip-on drywall.

2. Exposed Finish: Prime.

2.4 EXTERIOR DOORS AND FRAMES

A. Construct exterior hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 2 inches (50.8 mm).
c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A40 (ZF120) coating.
d. Edge Construction: Model 1, Full Flush
e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.

f. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
g. Core: Polystyrene or Polyisocyanurate

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
b. Construction: Full profile welded.

3. Exposed Finish: Prime

2.5 BORROWED LITES

A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm).

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 in (1.0mm) thick.
2. Compression Type for Drywall Slip-On Frames: Adjustable compression anchors.
3. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasterners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.8 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

A. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152mm) apart. Spot weld to face sheets no more than 5 inches (127mm) o.c. Fill spaces between stiffeners with glass-fiber insulation.
2. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
6. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors:
    a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
    b. Compression Type: Not less than two anchors in each frame.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.10 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.11 LOUVERS

A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.

B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specifications.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
b. Install frames with removable stops located on secure side of opening.

c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation of tolerances.

2. Floor Anchors: Provide floor anchors for each jam and mullion that extends to floor, and secure with post-installed expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8, NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.

a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).

2. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

A. Final adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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SECTION 084113 - ALUMINUM-FRAMED STOREFRONT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Storefront framing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Delegated design submittal: For aluminum-framed storefront windows indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For aluminum-framed storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.

d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.

E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

2.5 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.

D. Structural Profiles: ASTM B308/B308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A44, Class I, 0.018 mm or thicker.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

END OF SECTION 084113

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SECTION 088000 - GLAZING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Glazing materials and related accessories required for complete installation doors, frames, windows and other construction as indicated on drawings or specified.

1.02 References

A. Standards of the following:

1. American National Standards Institute (ANSI), "Safety Performance Standards and Methods of Tests for Safety Glazing Materials Used in Buildings," Z97.1-1984(R1994).
1. American Society for Testing and Materials (ASTM), standards as referenced herein.
2. Consumer Product Safety Commission (CPSC), "Safety Standard for Architectural Glazing Materials," 16-CFR, Part 1201, Latest Edition.
3. Glass Association of North America (GANA), "Glazing Manual," Latest Edition.
4. H.P. White Laboratories, Inc. (HPW), "Test Procedure – Transparent Materials for Use in Forced Entry or Containment Barriers," HPW-TP-0500.02.
5. Walker, McGough, Foltz, and Lyerla (WMFL), standards as follows:

    a. WMFL 30 Minutes Forced Entry Test.
    b. WMFL 60 Minutes Forced Entry Test.

6. Underwriters Laboratories (UL), "Standard for Burglary Resistant Glazing Material," UL 972-1995.
7. ASTM F-1915 Standard Test Method for Detention Glazing

1.03 DEFINITIONS:

A. Glass or Glazing: The term "glass" or "glazing" used throughout this specification section shall refer to any of the glass and glazing material products specified and scheduled; including polycarbonate, laminated polycarbonate and other indicated glass types.

1.04 SUBMITTALS:

A. Product Data: Submit for each type glazing material and accessory products specified, including glazing sealants, glazing tapes, setting blocks and edge blocks; indicating performance characteristics.

1. Include glazing channel designs for each type glazing material indicating manufacturer's recommendations for glass bite, clearances and glazing methods.
2. Include technical data and instructions for storage and handling of materials.

B. Test Reports: Submit test reports by an independent testing agency indicating compliance with specified performance requirements.

B. Samples:

1. Glazing material: Submit minimum 12-inch by 12 inch samples of each type of glazing material proposed for use.
2. Glazing accessories: Submit samples of each type accessory as specified, if requested by Architect

    a. Glazing tape: Minimum 12-inch (1'-0") length sample of each type glazing tape material proposed for use.
    b. Setting and edge block materials: One sample each of typical edge block and setting block materials.

C. Adhesion Compatibility Test Results: Submit for Architect's information only. Submit results of compatibility adhesion testing by glazing sealant manufacturer indicating that adhesion testing has been performed on actual samples of polycarbonate glazing material. Test shall determine if materials are compatible and adhesion is acceptable. Indicate requirements for primers or special preparation required to ensure proper adhesion of materials.

D. Maintenance Data: Submit glazing material manufacturer's maintenance data for cleaning and care of each type of glazing material installed. Include data in operations and maintenance manuals submitted with Contract Closeout documents.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: glazing installer shall have minimum Five (5) years experience in the successful installation of glazing materials same as those specified for this Project. If requested by Architect, submit references for projects completed within the past three years.

B. Regulatory Requirements:

1. Polycarbonate glazing: Complying with building code requirements for approved light transmitting plastics as specified.

    a. Southern Building Code Congress International (SBCCI) - Report Number 8788 Class CC-1 Approved Plastic.
    b. International Congress of Building Officials (ICBO) - Uniform Number 3286 Approved Plastic.

D. Labels:

1. Glazing shall bear manufacturer's label identifying type, quality and thickness of material. Labels for plastic glazing materials, if not available on each lite, shall at least be factory applied to shipping crates. All other glazing materials shall be required to bear labels on each lite either temporary or permanent types as required by governing building codes or certification agency where specified.

1.06 DESIGN AND PERFORMANCE REQUIREMENTS

A. Plastic Glazing: Complying with CPSC 16-CFR, Part 1201, Category II and weathering requirements of ANSI Z97.1.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials with manufacturer's identification, glass type, and thickness labeled on each piece or on shipping crates as specified. Remove no labels applied to glazing material until final cleaning.

B. Store glazing materials indoors away from direct exposure to the sun, in cool, dry area, off floor, equally supported to prevent stress and breakage.

B. Protect stored glazing materials as recommended by manufacturer to prevent from damaging effects of moisture, condensation, and extreme temperature changes. Maintain temperature in storage areas below 80 degree F.

C. Do not move cases, which have been partially unpacked. Unpack glazing materials in accordance with manufacturer's product data for type of material being handled. Stack individual lites as recommended by manufacturer's product data.

D. Handle glazing materials in manner to prevent damage to face or edges, do not drag, slide or drop units. Utilize rolling blocks to rotate glazing materials.

1.08 WARRANTY

A. General: Provide written warranty signed by manufacturer agreeing to furnish F.O.B. point of manufacture, freight allowed project site, within 45 working days after receipt of notice from Owner for the specified warranty period indicated below, replacements for those units which develop manufacturing defects.

A. Polycarbonate Glazing: Laminated and monolithic polycarbonate glazing materials shall be warranted against breakage, yellowing, loss of light transmission, abrasion, edge separation, delamination, material obstruction of vision thorough glazing, coating failure and against manufacturing defects for a period of minimum Five (5) Years beginning at Date of Material Completion.

PART 2 - PRODUCTS

2.01 POLYCARBONATE GLAZING

A. Monolithic Polycarbonate:

1. Acceptable products; subject to compliance with specified requirements:

a. American Acrylic Corp.
b. Smartgard, LTI Smartglass
c. Global Security Glazing
d. Palmer Americas
e. Saf-Glas, LLC
f. Viracon

2. Characteristics: Clear, ultra-violet resistant polycarbonate sheet glazing material; coated on both faces with manufacturer's abrasion resistant surface treatment.

   a. Thickness: As scheduled in Part-3 of this section.
   b. Flexural strength: Minimum 13,500 psi when tested in accord with ASTM D790-00.
   c. Tensile strength: Minimum 9500 psi ultimate strength when tested in accord with ASTM D638-01.
   d. Abrasion resistance: Maximum 4 % change in haze when tested in accord with ASTM D1044-99 using Taber abraser subjected to 100 cycles with applied constant load of 500 grams.
   e. Flammability: Less than 1-inch burning when tested in accord with ASTM D635-98 and complying with specified building code requirements for Class CC-1 combustibility classification.
   f. Security performance: Complying with UL 972 standard.

B. Laminated Polycarbonate:

1. Acceptable products; subject to compliance with specified requirements:

   a. Saf-Glas, LLC
   b. Smartgard, LTI Smartglass
   c. Global Security Glazing

2. Characteristics: Clear, multi-ply, laminated polycarbonate sheet glazing material bonded with manufacturer's standard interlayer. Outer face sheets shall be coated on exposed surfaces with manufacturer's ultra-violet and abrasion resistant treatment.

   a. Thickness: As scheduled along with specific product identification listed in Part-3 of this section.
   b. Abrasion resistance and flammability: Same as specified for monolithic polycarbonate.
   c. Flexural strength: Minimum 13,500 psi when tested in accord with ASTM D790-00.
   d. Security performance: Complying with specified Forced Entry Resistance requirements.

2.05 GLAZING ACCESSORIES

A. Setting and Edge Blocks: Provide materials compatible with glazing and sealants acceptable to glass and glazing manufacturers.

1. Characteristics: Dense elastomeric silicone or thermoplastic elastomers (TPE) rubber extrusions fabricated in to setting and edge blocks for use in glazing and sealing applications; complying with ASTM C864-99.

   a. Setting blocks: 80 to 90 Shore A durometer hardness when tested in accord with ASTM D2240-02.

      1) Thickness: 0.25-inch (1/4”), unless otherwise indicated.
      2) Length and width: Minimum 4-inch length by width equal to 1/16-inch to 1/8-inch greater than glazing thickness.

b. Edge blocks: 60 to 70 Shore A durometer hardness when tested in accord with ASTM D2240-02.

1) Thickness: 0.125-inch (1/8"), unless otherwise indicated.
2) Length and width: Minimum 4-inch length by width equal to 1/16-inch to 1/8-inch greater than glazing thickness.

B. Glazing Sealants: Provide materials compatible with glazing and sealants, acceptable to glass and glazing manufacturers.

1. Characteristics: Single component, neutral cure, elastomeric silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

a. Compatibility: Sealants shall be compatible with surfaces in contact when installed and under service conditions indicated, as demonstrated by manufacturer's compatibility adhesion testing on specified glazing material and proven field experience.
b. Color: Black.

C. Glazing Tapes: Provide materials compatible with glazing and sealants, acceptable to glass and glazing manufacturers.

1. Shimless Tape:

a. Characteristics: Preformed, cross-linked butyl tape, 100% solids.

1) Size: 1/8-inch thickness by 1/2-inch width.
2) Color: Black-bronze.

2. Pre-shimmed Tape:

a. Characteristics: Preformed, cross-linked buytl or polyisobutylene tape with integral continuous encased shim, 100% solids.

1) Size: 1/8-inch thickness by 1/2-inch width.
2) Color: Black-bronze.

D. Cleaners, Primers and Sealers: Provide types as recommended by sealant and glazing manufacturers; compatible with materials used and substrate surfaces encountered in installation.

E. Ensure that tape shall be covered by sealant to prevent tampering.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine frames and rabbets to which glazing is to be installed. Verify the following prior to beginning glazing work:

1. Framing is anchored secure in position, plumb, square and within specified tolerances.

2. Projections, burrs, irregularities and obstructions are removed from glazing rabbets and are clean and free of debris.
3. Offsets at corners are within specified tolerances.
4. Corners and fabricated intersections are sealed and framing is weather-tight.
5. Rabbets are of sufficient depth and width to receive specified glazing material including required bite, face and edge clearances.
6. Hollow metal frames have received paint finish as specified in Painting section.

B. Notify Architect if framing or opening conditions are not acceptable to receive specified glazing.

1. Do not proceed with installation of glazing materials until unsatisfactory conditions have been corrected and are acceptable to Architect and installer.
2. Installation of glazing materials to framing by installer shall confirm acceptance that conditions are satisfactory.

3.02 PREPARATION

A. Clean glazing channels and framing free of debris and protective coatings prior to start of glazing work.

1. Remove applied coatings from contact surfaces for wet glazing installation, unless testing indicates acceptable adhesion and compatibility.
2. Remove coatings and old glazing materials, which are not bonded firm to substrates, or which will prohibit installation of new glazing.
3. Remove lacquer from metal surfaces where sealants are to be applied.

B. Apply primers to surfaces, where required for proper adhesion complying with sealant manufacturer's recommendations.

C. Inspect glazing material prior to installation. Eliminate lites having face or edge damage. Remove and dispose damaged glazing including those exhibiting manufacturing defects or imperfections, which could weaken and impair performance of units when installed.

D. Clean glazing surfaces and edges free of moisture, dust, dirt, grease, oil and other contaminants prior to installation. Use cleaners and solvents as recommended by glazing and sealant manufacturers.

E. Plan and sequence installation so that framed openings are glazed and sealed on both sides of lite within workday to prevent accumulation of dust and dirt in glazing channels.

3.03 GLAZING INSTALLATION

A. Install glazing materials in accordance with manufacturer's product data and referenced GANA standards, except where more stringent requirements are specified.

B. Glazing installation shall provide for an air-tight and water-tight installation withstanding normal temperature changes without failure.

C. Protect glazing material faces and edges during handling and installation.

1. Use rolling blocks when rotating glass units.
3. Do not impact glass with metal framing components.

4. Use suction cups to shift lites within openings. Do not use pry bars to raise or drift glass.
5. Rotate glazing with flares or bevels along horizontal edges occurring in the vicinity of setting blocks so that they are located at top of opening and acceptable to glazing manufacturer.

D. Size glazing for each opening, ensuring correct bite on lite without imposing strain or stresses to material. Fit glazing to frame rabbet stops or channels providing 1-inch bite with plus or minus 1/8-inch tolerance, unless otherwise indicated.

E. Position glazing with pattern and draw oriented in the same direction, and with glass waves parallel to floor.

A. Maintain minimum 1/8-inch bed clearance between glazing material and frame or stop, on both sides of lite, except where greater clearances are required by either glazing material, sealant or framing manufacturer.

B. Install setting blocks to sill rabbet or in sill glazing pocket, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required by glazing manufacturer.

1. Size setting blocks in proportion to glass weight, but provide not less than minimum specified length.
2. Adhere setting blocks to frame rabbets or channels in thin bed of sealant. Use same sealant material as for heel bead application to set blocks in place.

C. Install edge blocks at vertical jambs and heads to limit lateral movement of glazing material. Provide edge blocks in specified minimum lengths. Maintain 1/8-inch clearance between edge of glass and edge block.

D. Set glazing material by using preformed tape.

1. Install continuous glazing tape around full perimeter of frame stops on both sides of glazing.
    a. Cut tape to required lengths allowing for tight-butted joints. Do not lap adjoining lengths of glazing tape.
    b. Set glazing tape positioned so that top edge is 1/4-inch below sight line of stop.
    c. Remove backing paper from tape just prior to setting glass.
2. Center glazing within frame rabbet, resting on setting blocks and pressed firm against tape with sufficient pressure to ensure full contact and adhesion at perimeter. Remove and reinstall glazing positioned closer than 1/8-inch required face clearance from frame stops.
3. Apply heel bead sealant as directed by manufacturer's product data with positive bond to glass edge and metal framing. Install heel bead continuous around perimeter edge of glazing and interfaced with setting block-bedding sealant.

E. Provide exterior glazing applications with weeping mechanisms to allow water, moisture and vapors to drain or escape from frame rabbets or channels.

1. Maintain coped or mitered corner joints of exterior removable sill stops open, clear and free of mastics, adhesives, sealants, dirt or other foreign materials which could interfere with water drainage or vapor release from exterior glazing pockets.

2. Install 1/16-inch thickness by 1-inch width continuous elastomeric sealant tape centered under bottom leg of exterior removable sill stops to minimize water penetration of frames.
    a. Apply tape to sill removable stops leaving gaps at screw holes and stopping 2-inches away from frame corners to form weeps for drainage of glazing pocket.
    b. Do not seal bottom of exterior removable sill stops. Leave gaps in tape clear and open to allow for drainage.

3.04 PROTECTION AND CLEANING

A. Upon completion of glazing installation, apply crossed streamers to framing across opening without touching glass to protect work. Do not mark on glazing surfaces.

B. Remove temporary labels and excess sealant from glazing after installation and clean adhesive marks, stains and other residue from surfaces.

C. Protect installed glazing materials from damages throughout construction. Keep glazing clean; do not let dirt, stains, scum, alkali deposits, coating or paint droppings, overspray or other contaminating substances to accumulate on surfaces. If surfaces are found contaminated, remove deposits promptly using manufacturer's recommended procedures.

D. All polycarbonate glazing exposed to direct sunlight shall have it’s masking entirely removed and recovered with plastic poly/duct taped to the frame. Failure to complete this protective task may result in the staining of the glazing or the masking becoming stuck to the polycarbonate.

E. Proper cleaning of the glazing systems shall be the responsibility of the general construction professional. It is recommended that a meeting between the GC, glazing installer, painter, and related trades be conducted to assure that subsequent trades do not damage the glazing.

F. Replace broken, cracked, chipped, abraded, scratched or otherwise damaged glazing materials just prior to Date of Material Completion. Damages occurring to glazing materials during construction period shall be replaced at no additional costs to Owner, including those caused by manufacturing defects. vandalism, acts of nature or accidents.

G. Just prior to Date of Material Completion, clean both sides of glazing. Clean surfaces using pre-tested detergent and water as recommended by glazing manufacturer. Rinse glazing to remove detergent film with clean water and dry surfaces with soft lint-free cloth or chamois to prevent waterspots.

H. Upon Date of Material Completion, instruct Owner's maintenance personnel on the care, cleaning and replacement of glazing materials. Provide glazing manufacturer's factory representative to train Owner's designated personnel in the procedures for cleaning, maintaining and replacing installed glazing materials.

3.05 SCHEDULE OF GLAZING TYPES

A. G – 1: Laminated Polycarbonate:

1. 3/8" nominal thickness, 2 ply mar resistant polycarbonate: 3/16" polycarbonate (Abrasion resistant), .025" urethane, 3/16" polycarbonate (Abrasion resistant).
2. ASTM F1233 Class III /ASTM 1915 Grade ~~2~~ 3, HP White Level II- TP-0500.02 / WMFL Level-III
3. Color:: Clear with translucent white interlayer.

END OF SECTION 088853

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SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.
2. Blank-off panels for louvers

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing according to AMCA 540.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.

2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

C. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade shall pass basic protection, when tested according to AMCA 540.

D. Seismic Performance: As indicated on drawings.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Nondrainable-Blade Louver :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Flow Company, Inc.
b. All-Lite Architectural Products.
c. Architectural Louvers; Harray, LLC.
d. Construction Specialties, Inc.
e. Greenheck Fan Corporation.
f. Louvers & Dampers, Inc.; a division of Mestek, Inc.

g. Ruskin Company.

2. Louver Depth: 6 inches or 8 inches as indicated on drawings
3. Blade Profile: Plain blade without center baffle.
4. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.080 inch for frames.
5. Mullion Type: Exposed

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
7. wire.

2.4 BLANK-OFF PANELS

A. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.
2. Panel Finish: Same finish applied to louvers.
3. Attach blank-off panels with clips or sheet metal screws

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless-steel fasteners.
4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
   1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
   2. Exterior Corners: Prefabricated corner units with mitered blades with concealed close-fitting splices and with fully recessed or semirecessed mullions at corners.

F. Provide subsills made of same material as louvers.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm] [AA-M12C22A31, Class II, 0.010 mm] or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 6-inch long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Gypsum.
b. CertainTeed Corporation.

c. Georgia-Pacific Gypsum LLC.
d. National Gypsum Company.

2. Thickness: 5/8”
3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Gypsum.
b. CertainTeed Corporation.
c. Georgia-Pacific Gypsum LLC.
d. National Gypsum Company.

2. Thickness: 1/2 inch
3. Long Edges: Tapered.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation.
b. Georgia-Pacific Gypsum LLC.
c. National Gypsum Company.

2. Core: As indicated on Drawings.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation.
b. Custom Building Products.
c. James Hardie Building Products, Inc.
d. National Gypsum Company.

2. Thickness: 5/8 inch or ½” as indicated

3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hilti, Inc.
b. Pecora Corporation.
c. USG Corporation.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings
2. Type X: As indicated on Drawings
3. Flexible Type As indicated on Drawings
4. Ceiling Type: As indicated on Drawings

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect, but no more than 30 feet o.c.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

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SECTION 093013 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes interior applications of the following:
   1. Ceramic Mosaic Tile
   2. Waterproof membrane
   4. Accessory and installation materials.

B. Related Sections:
   1. Division 09 Section "Gypsum Board Assemblies" for gypsum board assemblies including tile backer board to be installed in association with vertical applications of tile as covered in this Section.
   2. Division 09 for various additional finishes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details and location of expansion, contraction, control and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
   2. Full-size units of each type of trim and accessory for each color and finish required.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type composition, and color indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installer is a five-star member of the National Tile Contractors Association.
2. Installer's supervisor for Project holds the International Masonry Institute's Forman Certifications
3. Installer employs Ceramic Tile Education Foundation Certified Installer or installers recognized by the U.S. Department of Labor as Journeyman Tile layers.

B. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Floor-Score Compliance: Tile for floors shall comply with requirements of Floor Score Standard.

D. Coefficient of Friction: Floor Tile in all interior or exterior areas to be as stated below, as measured by ASTM C 1028. For exterior walk surfaces or interior floors subject to wetting, compliance to be based on measurement as "wet."
1. Level surfaces: 0.60 minimum.

2.2 TILE PRODUCTS

A. Tile Products:
1. Manufacturers / sources include the following; specific applications and products are as indicated on drawings. Refer to Sheet I0-01 Finish Legend and Key Notes.

2. Acceptable Manufacturers: Provide product indicated on drawings or comparable product by one of the following:
a. American Olean; a Division of Mohawk Industries, Inc.
b. Traditions in Tile and Stone.
c. Specialty Tile Products
d. DalTile
3. Composition: As indicated on drawings
4. Module Size: As indicated on drawings
5. Thickness: As indicated or as inherent to product indicated on drawings.
6. Surface: Slip-resistant, with abrasive admixture at floors.
7. Tile Color and Pattern: As indicated on drawings.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes.

2.5 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

2. 6 GROUT MATERIALS

A. Water-Cleanable Sanded Grout: ANSI A118.6.
1. Basis-of-Design: Specific products as indicated on drawings.
2. Manufacturers: Provide products by one of the following:
a. Bonsal American; an Oldcastle company.
b. Bostik, Inc.
c. Laticrete International, Inc.
d. MAPEI Corporation.

2. 7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
   1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Backer Board:
   1. Walls: Refer to Division 09 Section “Gypsum Board Assemblies”.

C. Tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

E. Reducer Strips: Resilient transition / reducer strips per I-001 Finish Schedule and Key Notes, finish as selected by Architect from manufacturer’s standards.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, and free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile follows installed with bonded mortar bed comply with surface finish requirements in ANSI 108.01 for installation indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. Comply with applicable TCA Handbook for Tile Installation requirements listed below:
      a. Interior Floors, Over Concrete; On-Ground Concrete; Ceramic Tile F-113-16
         i. Refer to Membrane Options should existing in-plane cracks be present

      b. Interior Floors Over Concrete; Above Ground Concrete; Ceramic Tile; F113A-16
         i. Refer to Membrane Options should existing in-plane cracks be present

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work

and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with 1/16 inch joint width.

F. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

G. Waterproof Membrane: install per manufacturer's recommendations as required

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter and haze.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093013

SECTION 096723.01 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.

1. Application Method: Metal, power or hand troweled.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy mortar based system with decorative quartz topping). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer,

with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.

a. Include 48-inch (1200-mm) length of integral cove base.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include,

1. Must comply with troweled mortar base with broadcast topping. Liquid rich, slurry type systems will not be accepted, and will result in a disqualification from bid.

B. Acceptable Manufactures,
1. Stonhard (Basis of design)
2. Florock
3. Dex-O-Tex Advanced Flooring and Water Proofing System

C. Products: Subject to compliance with requirements:

1. (Basis of design) Stonhard, Inc.; Stonshield HRI®. with Matte Urethane Sealer Coat

D. System Characteristics:

1. Color and Pattern: Choose from Mfg. Standards
2. Wearing Surface: medium.
3. Integral Cove Base: 4 inches.
4. Overall System Thickness: nominal 1/4”

E. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:

a. Material Basis: Standard Primer
b. Resin: Epoxy
c. Formulation Description: (2) two component, 100 percent solids.

d. Application Method: Squeegee and roller.
e. Number of Coats: (1) one.

2. Mortar Base:

a. Material design basis: Stonclad GS
b. Resin: Epoxy.
c. Formulation Description: (3) three component, 100 percent solids.
d. Application Method: Metal Trowel.
   1) Thickness of Coats: nominal 3/16" (inch).
   2) Number of Coats: One.
e. Aggregates: Pigmented Blended aggregate.

3. Undercoat:

a. Material Basis: Stonshield undercoat.
b. Resin: Epoxy
c. Formulation Description: (2) two-component, 100% solids, UV Stable.
d. Type: Clear.
e. Finish: Gloss.
f. Number of Coats: one.

4. Sealer:

a. Material Basis: CF7 Sealer
b. Resin: Alaphatic Urethane
c. Formulation Description: (2) two-component, 100% solids, UV Stable.
d. Type: Clear.
e. Finish: Gloss.
f. Number of Coats: two.
g. Texture level: medium.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 10,000 psi after 7 days per ASTM C 579.
2. Tensile Strength: 2,000 psi per ASTM C 307.
3. Flexural Strength: 4,300 psi per ASTM C 580.
4. Water Absorption: < 1% per ASTM C 413.
5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.

2.2 ACCESSORY MATERIALS

A. Pitching Material: Resinous pitching grout, only. Cementitious materials are not approved and the inclusion of these materials can result in disqualification of bid. Resinous grout to be approved by the manufacturer and cover an inclusive warranty for flooring material applied flooring materials. Pitching were specified at the pitch indicated on bid documents.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

C. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:

    a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.

    a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75 percent.
    b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. of slab in 24 hours.
    c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

C. Integral Cove Base: Stonshield cove mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.

1. Integral Cove Base: 6 inches high.

D. Apply metal trowel single mortar coat in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

E. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

F. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS

A. Chase edges to “lock” the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:

1. Exterior Substrates:

a. Exposed glued-laminated beams and columns.
b. Exposed framing.
c. Dressed lumber (finish carpentry or woodwork).

B. Related Requirements:

1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of finish system and in each color and gloss of finish required.

1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Benjamin Moore & Co.
2. Coronado Paint; Benjamin Moore Company.
3. Dulux (formerly ICI Paints); a brand of AkzoNobel.
4. PPG Paints.
5. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Stain Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are

taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

D. Exterior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Prime edges, ends, faces, undersides, and backsides of wood.

    a. For solid hide stained wood, stain edges and ends after priming.
    b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.

3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates: Glued-laminated construction.

1. Solid-Color, Solvent-Based Stain System[MPI EXT 6.1C]:

    a. Prime Coat: Primer, alkyd for exterior wood[, MPI #5].

b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, solvent based, solid hide[, MPI #14].

B. Wood Substrates: Exposed framing.

1. Solid-Color, Solvent-Based Stain System[MPI EXT 6.2D]:

a. Prime Coat: Primer, alkyd for exterior wood[, MPI #5].
b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, solvent based, solid hide[, MPI #14].

C. Wood Substrates: Wood trim

1. Solid-Color, Solvent-Based Stain System[MPI EXT 6.3C]:

a. Prime Coat: Primer, alkyd for exterior wood[, MPI #5].
b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, solvent based, solid hide[, MPI #14].

END OF SECTION 099300

SECTION 101400 - INTERIOR SIGNAGE AND GRAPHIC ELEMENTS

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 10 14 19 – Dimensional Letter Signage.

1.2 SUMMARY

A. Perform all work required to furnish and install the signs and graphic devices as indicated by Contract Documents.

B. This section includes all sign types and the specification of system to be used for this project.

1.3 REFERENCES

A. ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1986 edition.

B. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336, (ADA).

C. 2010 Standards for Accessible Design (SAD): The updated ADAAG (ADA Accessibility Guidelines), effective on March 15, 2011 and made mandatory on March 16, 2012.

1.4 GENERAL INFORMATION

A. Signage under this section is intended to include items for identification, direction, control, and information within a building where installed as a complete integrated system from a single manufacturer.

B. ADA Design Requirements:

1. Provide signage that conforms to the requirements of all regulatory agencies holding jurisdiction.
2. Comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. Requirements include, but are not limited to the following:
    a. Tactile copy must be all upper case and raised at least 1/32". Tactile characters must be sans serif, not italic, not oblique, script or highly decorative.
    b. The stroke width of the upper case "I" has to be 15% of the letter height or less. The character width of the uppercase "O" must be between 55% and 100% of the height of the corresponding uppercase "I".
    c. The copy height for tactile information must be between 5/8" and 2". If separate visual characters are provided, raised characters can be ½" and need not contrast with the background.
    d. The distance between characters on tactile copy must be a minimum of 1/8" and a maximum of 4 times the character stroke width. These distances are measured between the closest points of adjacent characters.

e. Spacing between lines of tactile copy needs to be a minimum of 135% and a maximum of 170% of the corresponding upper case "I" height (measured from baseline to baseline).
f. Braille must be Grade II and positioned directly below the corresponding raised characters. If text is multi-lined, Braille is placed below the entire body of text and separated 3/8" from any other tactile characters and 3/8" minimum from raised borders and decorative elements.
g. Visual characters and symbols, and their background, are to have a non-glare finish. The color of raised characters must contrast as much as possible with their background to make sure signs are more legible for persons with low vision.
h. Pictograms, selected from International Standards, are to be located within a 6" vertical void and accompanying text descriptions are to be located directly below the pictogram

1.5 SUBMITTALS

A. Submit the following according to the conditions of the Contract.

B. Product Data:
Manufacturer's data sheets on each product to be used, including:
1. Manufacturer's product literature indicating units and designs selected.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Samples:
Manufacturer shall include, but are not limited to complete units of repetitively used materials and swatches showing color, texture, and/or pattern.
1. Acrylic: Provide three (3) samples each not less than 4"x4" of each material w/specified color and/or finish.
2. Vinyl Film or Digitally Printed Film: Provide three (3) samples each not less than 4"x4" of each material and/or color.
3. Paint: Provide three (3) samples each not less than 4"x4" of each paint finish.

D. Shop Drawings:
1. Include plans, elevations, and large scale sections of typical components and construction methods.
2. Include dimensions, identification of materials, and identification of color and/or finish.
3. Show anchors, reinforcement, and installation required accessories.
4. Include electrical requirements and/or lighting spec when required.
5. Include text layouts with (2) alternate readings as required.
6. Provide structural engineering data calculations and stamped documents for record when required by contract documents.

E. Message Schedule:
1. Include message list by location and sign type for approval.

F. Sign Program Maintenance Plan:
1. Manufacturer shall provide details of software and system of pre-perforated paper sign inserts allowing client to update and maintain signage graphics in-house.

2. Manufacturer shall provide details of an Online Reordering & Maintenance Application whereby the client can submit sign reorders online and store relevant project information such as sign type drawings, message schedules and product instructions.

G. Contract close out:
1. Provide Manufacturer's Warranty for craftsmanship and material finish.
2. Maintenance data and cleaning requirements for sign surfaces.
3. Provide MSDS data when required by contract documents.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. See approved manufacturers in Part 2- 2.1

B. Installer Qualifications: Trained and authorized by manufacturer for installations of required scope and product.

1.7 DELIVERY, STORAGE & HANDLING

A. Package signs to prevent damage during shipment, handling, storage and installation. Products are to remain in their original packaging (unless otherwise specified) until removal is necessary for installation.

B. If installation site is not ready for signage upon delivery, store signs in a dry, air-conditioned environment.

C. Handle signage in accordance with manufacturer's instructions.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 SEQUENCING AND SCHEDULING

A. Schedule system installation after room finishes and fixtures have been completed.

1.10 WARRANTY

A. Product Warranty: Provide manufacturer's warranty against defects in materials and workmanship for a minimum period of 1 year(s).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Interior modular sign as manufactured by: Image Manufacturing Group, LLC (IMG) kbeck@imgarchitectural.com

B. Acceptable Manufacturers:
1. Image Manufacturing Group

2. Inpro Corporation
3. ASI Signage Innovations

2.2 ACCEPTABLE PRODUCT

A. As designed within these documents, see drawings and specifications

B. Substitutions to be approved by Design Professional.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.3 SYSTEM REQUIREMENTS

A. General:

1. Sign system shall feature solutions for all required sign types, including but not limited to wall mounted personnel signs, work station personnel signs, primary room identification, directories, directionals, overhead signs, projection wall signs, restroom signs, regulatory and information signs, and changeable slide conference room signs. All signs within the system must convey a uniform look throughout.

B. Features:

1. Sign Assembly: Sign shall feature surface & subsurface graphic elements & logos.
   a. Backplate to be non-glare ¼" acrylic featuring raised graphics and Grade II Braille, design lines per drawing specifications
   b. ADA Face Panel: Primary face panels shall be ¼" N2 matte acrylic unless otherwise specified.

C. Graphics and Typography:

As selected by Design Professional. Standard ADA compliant Fonts/Symbols.

D. Colors and Finishes:

1. Approved Paint Finishes: Akzo Nobel and Mathews Paint Company
2. Approved Vinyl Film(s): 3M, Avery, and Oracal
3. Approved Laminate(s): Wilsonart and Chemetal
4. Approved Integral Acrylic: Rowmark

E. ADA Compliance:

Sign system shall comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. This includes requirements regarding which sign types require Braille/tactile features, character heights, raised character spacing, raised character stroke width, color contrast and installation locations and mounting heights within the facility.

F. Materials and Construction:

1. See Product Drawings

2.4 Sign Types

A. Sign Type A-1, A-2, & A-3: ¼" thick subsurface painted acrylic with silkscreened logo & design lines, featuring raised copy and Grade II Braille.
   1. Overall Dimensions - see drawing
   2. Typical Uses – Restroom ID

B. Sign Type B: ¼" thick subsurface painted acrylic with silkscreened logo & design lines, featuring raised copy and Grade II Braille
   1. Overall Dimensions - see drawing
   2. Typical Uses – Room ID

2.5 Sign Type Designation

A. It is the responsibility of the signage fabricator to plan, locate, qualify, comply with ADA and create messages for all doors and submit to Design Professional / Owner for review and approval.

B. Message schedule should designate sign types accordingly.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Design Professional of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions, in locations and with mounting methods as specified in sign and location drawings.

B. Square, plumb and level all installed products.

C. Install all signage in accordance with the 2010 Standard for Accessible Design (SAD) effective in March 2011, and any applicable local regulations and/or codes.

D. Upon completion of the work, sign installer shall remove any unused products, materials, packaging and debris from the installation site.

3.4 CLEANING

A. Clean all exposed surface not more than 48 hours prior to Date of Material Completion in accordance with manufacturer's written cleaning instructions.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Material Completion.

3.6 SIGN SCHEDULES

A. Refer to Signage Schedule and Drawings for sizes, locations, sign types, layouts, typestyle specifications, sign text/copy and sign graphics.

END OF SECTION 10 14 00

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of each type of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.
3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. APCO Graphics, Inc.
b. ASI Sign Systems, Inc.
c. Metal Arts.

2. Character Material: Sheet or plate aluminum.
3. Character Height: As indicated on Drawings.
4. Thickness: 0.25 inch (6.35 mm).
5. Finishes:
   a. Integral Aluminum Finish: Clear anodized.

6. Mounting: Concealed studs.
7. Typeface: As indicated on Drawings.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish nonferrous-metal devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant slots unless otherwise indicated.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

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SECTION 102113 - STAINLESS-STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: Three hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 STAINLESS-STEEL TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Accurate Partitions Corp., an ASI Group Company.
2. Bradley Corporation.
3. Global Partitions Corp., an ASI Group Company.

B. Toilet-Enclosure Style: Floor anchored.

C. Urinal-Screen Style: Wall hung flat panel.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf (1112 N), when tested according to ASTM F 446, without deformation of panel.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.
2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches (32 mm) thick.
3. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum 6 inches (152 mm) wide at wall and minimum 1 inch (25 mm) wide at protruding end.

F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch (0.95 mm).
2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.050 inch (1.27 mm).
3. Panels: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
4. Doors: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
5. Flat-Panel Urinal Screens: Thickness matching the panels.

G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

H. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets; stainless steel.

I. Stainless-Steel Finish: Manufacturer's standard textured finish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch (13 mm).
b. Panels and Walls: 1 inch (25 mm).

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.

a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.15

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Underlavatory guards.

B. Related Requirements:

1. Section 093013 "Ceramic Tiling".

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PUBLIC-USE ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue (Jumbo-Roll) Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation.

2. Basis of Design: Bobrick Surface-Mounted Twin Jumbo-Roll Toilet Tissue Dispenser, B-2892
3. Description: Two-roll unit with sliding panel to expose other roll.
4. Mounting: Surface mounted.
5. Capacity: 9- or 10-inch- (228- or 254-mm-) diameter rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin)
7. Lockset: Tumbler type.
8. Refill Indicator: Pierced slots at front.
9. Roll towel dispensers extend farther from the wall than folded towel dispensers.

C. Liquid-Soap Dispenser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation.

2. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40-fl oz. (1.2-L).
5. Materials and Finish: Stainless Steel, No. 4 finish (satin) for container, plastic push button and spout

6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

D. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.2 mm) thick.

    a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 1-1/4 inches (32 mm)
5. Configuration and Length: As indicated on Drawings

E. Mirror:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation.

2. Frame: Stainless-steel angle, heavy-gauge

    a. Corners: Welded and ground smooth

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Size: 24” x 36”

F. Coat Hook:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation.

2. Basis of Design: Bobrick ClassicSeries Surface-Mounted Single Robe Hook, B-6717.

3. Description: Single-prong unit.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.2 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.

B. Warm-Air Dryer:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.
    c. Excel Dryer Inc.

2. Basis of Design: Bobrick QuietDry Series TrimDry Surface-Mounted ADA Dryer, B-7128.
3. Description: Standard-speed, warm-air hand dryer.
4. Mounting: Surface mounted, with low-profile design.
5. Operation: Electronic-sensor activated with timed automatic power cut-off.

    a. Operation Time: 90 seconds.

6. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
7. Electrical Requirements: 115 V, 15 A, 1725 W.

2.3 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.

B. Diaper-Changing Station:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Specialties, Inc.
    b. GAMCO Specialty Accessories; a division of Bobrick.
    c. Koala Kare Products.

2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

    a. Engineered to support minimum of 250-lb (113-kg) static load when opened.

3. Mounting: Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.

5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
6. Liner Dispenser: Built in.

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Buckaroos, Inc.
   b. Plumberex Specialty Products, Inc.
   c. Truebro by IPS Corporation.

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.5 MATERIALS

A. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

F. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 312301 - EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the excavation, backfilling and compacting required for the structures shown in the Contract Drawings.

1.2 RELATED SECTIONS

A. Section 014525 - Structural Testing/Inspection Agency Services.

1.3 REFERENCES

A. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

F. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 DEFINITIONS

A. Granular subbase: Granular fill directly beneath slabs-on-grade.

B. Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural fill: Fill under the structure other than the granular subbase.

1.5 SUBMITTALS

A. Upon request, submit soil test reports performed by the Structural Testing/Inspection Agency.

1.6 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Verify structural fill complies with specifications.

2. Determine particle size, liquid limit, plastic limit, plasticity index and maximum density of each type of soil.

3. Observe proofrolling.

4. Perform a sufficient number of field density tests to verify compaction of structural fill.

   a. As a minimum, perform one test per lift for every 400 cubic yards and/or 2'-0" of fill placed.
   b. In limited fill areas perform 1 test per day.

5. Verify foundation bearing capacity.

6. Verify quantities of material removed and quantities of material placed where Unit Prices are involved.

1.7 SURVEY

A. Prior to construction, have structure location staked and certified by a licensed surveyor. If discrepancies between actual lines and elevations exist, notify Design Professional before proceeding with layout of structure.

1.8 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making any subsurface explorations.

1.9 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Design Professional and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Design Professional immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.10 NOTICE

A. Notify the Design Professional 48 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.1 GRANULAR SUBBASE

A. Granular subbase shall be sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.2 BACKFILL

A. Backfill shall meet the requirements of the structural fill.

2.3 STRUCTURAL FILL

A. Structural fill shall consist of clayey sand, sand, or sandy clay with a plasticity index less than 30 and a maximum dry density of 90 pounds per cubic foot.

B. Structural fill shall be free of organics, debris and deleterious materials.

C. Structural fill shall be free non-soil material and rock fragments greater than 4".

D. Soil types that may be used as structural fill include SM, ML and CL.

E. Existing soil may be determined to be usable in the field by a geotechnical engineer. Soils classified as wet of optimum may be reused provided the moisture is properly adjusted to be with in the workable range.

PART 3 - EXECUTION

3.1 STRIPPING

A. Strip vegetation, topsoil, roots, and other unsuitable material to a depth determined by the Structural Testing/Inspection Agency but not less than one foot, nor less than 10 feet outside the perimeter of the structure.

B. Stockpile sufficient amounts of topsoil as required to cover areas to be landscaped with a minimum of six inches of material.

3.2 EXCAVATION

A. Excavation shall be considered unclassified.

B. Perform excavation to the depths and limits on the Drawings and as specified herein.

C. Do not excavate to full depth when there is probability of frost forming or ground freezing in excavation before concrete is placed.

D. Under-cut of 2'-6" is anticipated for 30% of the building site. Limits and extent shall be determined by the geotechnical engineer on site at the time of excavation. Excavated areas shall be filled with structural fill.

E. Under-cut the will be required in areas with organic material greater than 5% of the soil composition. Excavated areas shall be filled with structural fill.

F. Ground water may be encountered during the foundation excavation. Provide a system for controlling the ground water to a level at least three feet below the lowest point of the excavation.

G. Keep excavations dry by sloping ground away from holes and trenches.

3.3 PROOFROLLING

A. After stripping or excavation and before any fill placement, fill areas shall be proofrolled with a minimum of two coverages of a loaded dump truck or scraper in each of two perpendicular directions.

B. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

3.4 PLACEMENT OF STRUCTURAL FILL

A. Do not place structural fill on subgrade that contains frost, mud or is frozen.

B. Structural fill shall be placed and compacted in 8 -inch thick loose layers.

C. Compact structural fill to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +3.0/-3.0percent of the optimum moisture content. The top 12" shall be compacted to 98 percent of the maximum dry density.

3.5 PLACEMENT OF GRANULAR SUBBASE

A. Do not place granular subbase on subgrade that contains frost, mud or is frozen.

B. Compact granular subbase to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with the water content within +3.0/-3.0 percent of the optimum moisture content.

3.8 PLACEMENT OF BACKFILL

A. Backfill behind wall shall be placed in layers of six inches.

B. Compact backfill behind walls to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +3.0/-3.0 percent of the optimum moisture content.

3.9 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION 312301

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