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PRODUCT TEST REPORT
ICF HANGER LATERAL TESTING

Prepared For:

RP Watkins
5516 West Memorial Road,
Oklahoma City, OK 73142

Attention: Mr. Michael Summers

Project Number: FC09744.000-470

Report Number: 1588 (Rev. 0)

February 1, 2021

CTL | THOMPSON INCORPORATED

February 1, 2021

RP Watkins
5516 West Memorial Road,
Oklahoma City, OK 73142

Attention: Michael Summers
President

Subject: Product Test Report
ICF Hanger Lateral Testing
CTL|T Project Number: FC09744.000-470

Mr. Summers,

Per our agreement, product capacity testing was completed on the RP Watkins supplied joist hangers precast in ICF concrete walls. At your request, the hanger product was tested in a lateral direction. All samples were produced and supplied by the client. (See Attached Shop Drawing and Concrete Specifications)

Product Description

The Watkins Hanger is used for ICF (Insulated Concrete Form) construction. The Watkins Hanger (see shop drawings) is a single piece of cold-formed steel that is used to connecting wood joists or beams to an ICF wall section. Prior to concrete placement of an ICF wall, the hanger is inserted through the insulation at the location of a joist, truss or similar wood framing component. Reinforcing bars are added within the ICF and concrete placed to complete the ICF and hanger assembly with the seat portion of the hanger protruding outside the ICF wall. Framing is later fastened to the bracket by nailing through the holes in the hanger product.

Test Sample Description

Each test sample consisted of two ICF wall sections (20”x 24” x 9” thick), each with a precast joist hanger installed. The wall sections were connected by a 2x10 wood joist (18” long) with Simpson N10D nails. See Figure 1 below for typical test setup. For all tests, nails and wood members were installed per manufacturer’s instructions and in general accordance with ASTM D7147.

Test sample ICF sections were constructed by the client and shipped to our laboratory for testing. The concrete mix was reported to be a 2,500-psi design strength mix (Mix Number: RMT258N3). Actual concrete strength was unknown at the time of testing.

Testing Procedure

Three samples were tested on January 14th and 15th, 2021 using a calibrated universal testing machine. Samples were tested per client’s instructions and in general accordance with procedures outlined in ASTM D7147 (Standard Specification for Testing and Establishing Allowable Loads of Joist Hangers). Samples were arranged on their sides to simulate a lateral loading configuration. A preload of 100 lbf was applied prior to testing. A constant load was then

applied to the center of the 2x10 joist along the weak axis (lateral). The load application was distributed using a load transfer block so as to not prematurely fail the wood member. The load was applied at a rate of 0.2 inches per minute. Testing was terminated when nail pullout and joist bending occurred.

Deviations from Standard Procedure

The testing requirements and procedures presented in ASTM D7147 were followed where possible. Deviations from the ASTM procedure include:

- Test samples were arranged on their sides such that the joist was loaded on the weak axis of the lumber creating a lateral load on the precast joist hanger.
- Failure was determined to be when the wood member and the hanger specimen were no longer in connection.
- Determination of Yield and Ultimate loads were modified as the very strict requirements of the ASTM standard apply to vertical deflections and do not apply properly to lateral performance. Determination of these points is described below.

Summary of Testing Results

The capacity selection criteria in ASTM 7147 are intended for vertical load arrangements and are not well suited for lateral applications. Yield load and Ultimate load determination was performed per the following.

Yield Load: The Davisson 0.2% Offset method was used to determine the yield load of the samples. For this testing arrangement, the Davisson Offset is based on the 3-inch distance between each joist hanger and the load transfer block. Because of the very short offset distance, the offset line is essentially on top of the elastic deformation (test data) line. Therefore, the yield load shown is approximately when the load-deflection curve no longer linear, and the system had reached a state of plastic deformation.

Ultimate Load: In general, the ultimate load applied is the maximum recorded test load of each sample. However, as the bracket fails laterally, it crushes down against the test block with ever increasing strength. Therefore, an appropriate point must be selected by the testing engineer to be the ultimate load. In this case, the testing was terminated when the upper side nails had lost contact with the wood member. Although the load continued to increase and no critical failure occurred, the hanger and wood joist were no longer in proper connection necessary for correct vertical load support, therefore the test terminated. Photographs of final bracket condition that illustrate this failure condition are included with the testing reports presented in this report. The reported ultimate test strength limit is based on the ultimate load per hanger divided by 3 per ASTM 7147 Section 13.

The table below summarizes results from lateral testing of the hanger.

Table 1. Summary of Test Results

ICF WATKINS HANGER					
Sample	**Yield Load, Hanger A[1] (lbs)**	**Yield Load, Hanger B[1] (lbs)**	**Ultimate Test Load[2] (lbs)**	**Ultimate Load Per Hanger[3] (lbs)**	**Reported Test Strength Limit[4] (lbs)**
C1	1,533	1,517	6,122	3,061	1,020
C2	1,531	1,539	6,439	3,220	1,073
C3	1,586	1,557	6,034	3,017	1,005
Average	**1,544**		**6,198**	**3,099**	**1,033**

[1] *Yield Load based on the Davisson 0.2% offset.*
[2] *Ultimate Test Load is the maximum recorded test load for each test*
[3] *Ultimate Load Per Hanger is the ultimate test load divided by two.*
[4] *Test Strength Limit per ASTM D7147 Section 13.3.1. The ultimate load per hanger divided by a factor of safety of 3.0.*

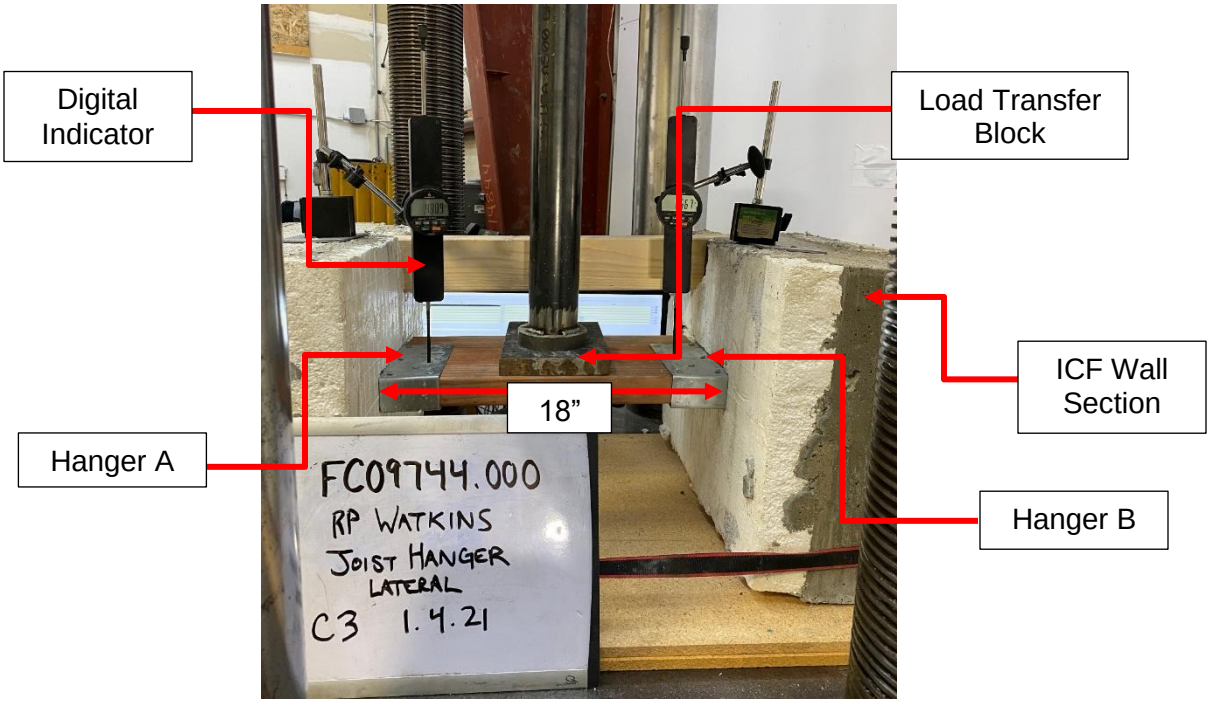

Figure 1. Typical Test Setup

We appreciate the opportunity to work with you on this project. If you have any questions regarding the information provided in this report, please do not hesitate to contact us.

Sincerely,
CTL|THOMPSON, INC.

Ryan S. Beck, P.E.
Project Manager
Accredited Laboratory Manager

Reviewed by:

R.B. “Chip” Leadbetter, III, P.E.
Senior Geotechnical Engineer
Accredited Laboratory Director

Report Authorized for Release:

Document Approved for Release
TL-342

RSB

Feb 1 2021

Revision Log

Date	*Revision No.*	*Explanation*	*By*
02.01.2021	*0*	*Initial Issue*	*R. Beck, Manager*

ICF HANGER
LATERAL LOAD TEST

CTL | THOMPSON
INCORPORATED

Client:	RP Watkins
Job Number:	FC09744.000
Product:	IFH28 Watkins Hanger

Reference Method

Tests were conducted according client's instructions and in general accordance with ASTM D7147.

Deviations from Standard Procedure

Test samples were arranged on their sides such that the joist was loaded on the weak axis of the lumber creating a lateral load on the precast joist hanger, rather than a vertical download as described in ASTM D7147. Failure was determined to be when the wood member and the hanger specimen were no longer in connection.

Standard Procedure

Product dimensions were verified to design drawings for all specimens. Individual specimens were joined with a section of 2x10 lumber for testing. (18) Simpson N10D x 1-1/2" long nails were used with each hanger per manufacturer's specification. Each specimen was then loaded into a vertical load frame on their sides to apply load to the specimen in a lateral direction to the hangers (see Figure 1 above). Both applied load and resulting deflection at each hanger were recorded. Load was applied at a uniform rate of 0.2 inches per minute. Testing was terminated when the wood member and the hanger were no longer in connection due to joist bending and nail pullout.

Summary of Results

Specimen Number	Measured Yield Load[1], Hanger A (lbs)	Measured Yield Load, Hanger B (lbs)	Maximum Test Load[2] (lbs)	Ultimate Load Per Hanger[3] (lbs)	Failure Mode
C1	1,533	1,517	6,122	3,061	Nail Pullout and Joist Bending
C2	1,531	1,539	6,439	3,220	Nail Pullout and Joist Bending
C3	1,586	1,557	6,034	3,017	Nail Pullout and Joist Bending

[1] Yield Load based on Davisson 0.2% offset
[2] Maximum recorded test load per test.
[3] Ultimate load per hanger. Maximum test load divided by two.

SHOP DRAWINGS
AND
CONCRETE SPECIFICATIONS

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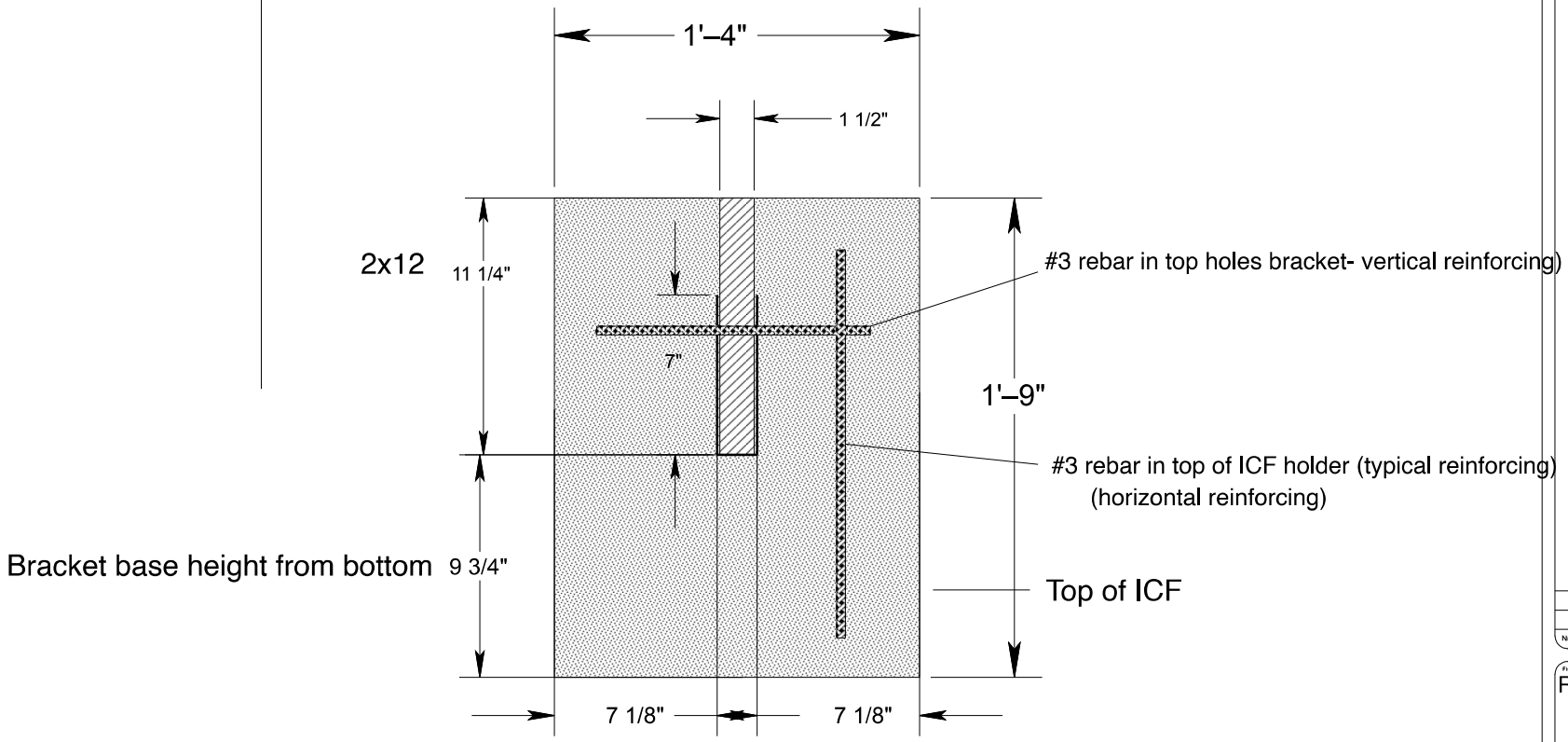
Specifications

Wall Reinforcing -#3 on 16" OC horizontally
Vertically 18" OC

2500 PSI concrete



Sample to be rotated 90 degrees counter clockwise for loading from side of bracket.

General Notes

Test Wall design Lateral Load

No.	Revision/Issue	Date

Firm Name and Address

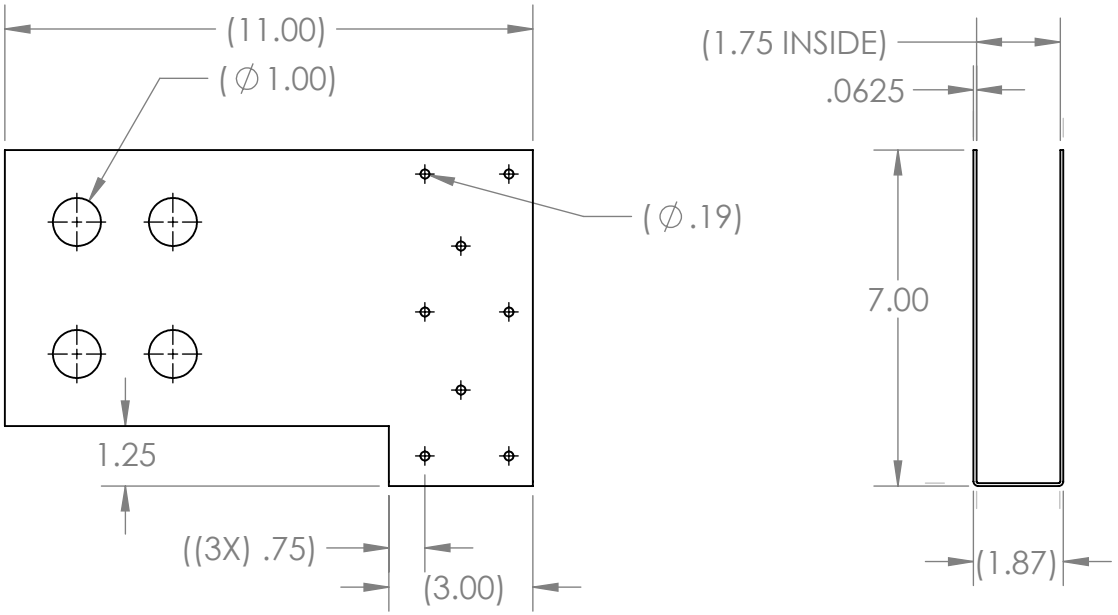
RP Watkins LLC

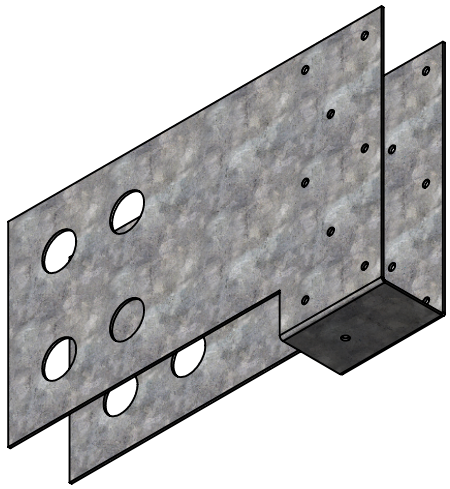
405-664-0010
www.greenmachinebuildings.com

Project Name and Address

Project
Date
Scale
Sheet

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
SH2 - B2	A	REDRAWN, (6X) 2.25 WAS (6X) 2.63	10/31/2020	MS





		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ±2° BEND ±2° TWO PLACE DECIMAL ±0.030 THREE PLACE DECIMAL ±0.015	DRAWN	AD	5/3/17
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 16 GA GALVANIZED STEEL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

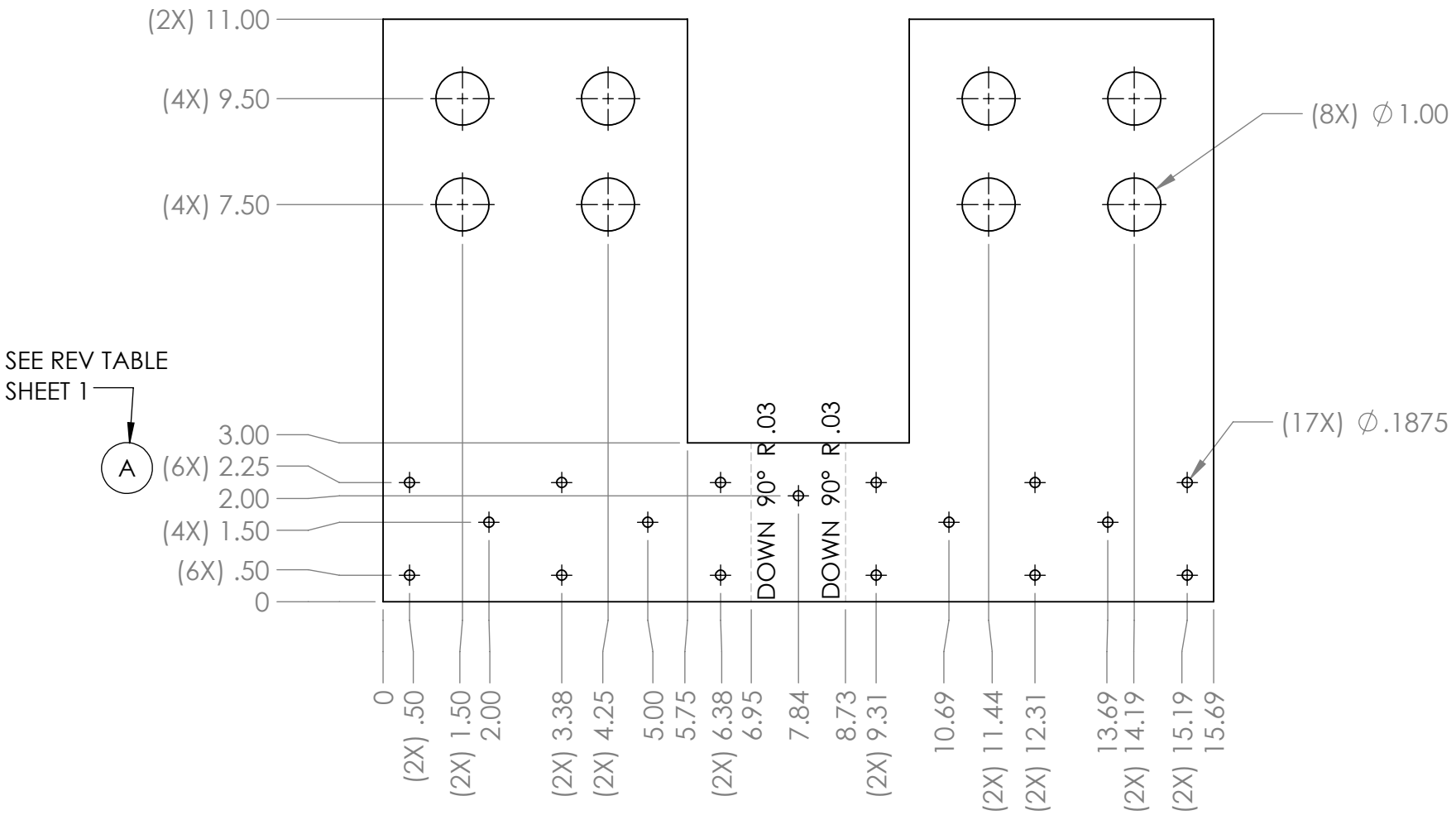
RP Watkins

TITLE:

IFH SERIES

SIZE	DWG. NO.	REV
A	IFH28-11-REVA-2020	A

SCALE: 1:4 | WEIGHT (lbs) 2.35 | SHEET 1 OF 2



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ±2° BEND ±2° TWO PLACE DECIMAL ±0.030 THREE PLACE DECIMAL ±0.015	DRAWN	AD	5/3/17
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 16 GA GALVANIZED STEEL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

RP Watkins

TITLE:

IFH SERIES

SIZE	DWG. NO.	REV
A	IFH28-11-REVA-2020	A

SCALE: 1:3	WEIGHT: 2.35	SHEET 2 OF 2

-

,
Tel :

Date : **1/28/2021**

Mix Code : **T258N3** Description : **2500 PSI 3/8" CHIP - CFA**

Revision Number : 4 Creation Date : 18 May 2017 Customer :

Plant : Mohawk Concrete Created By : mburrows Project :

Specifications

Consistence Class : 6.00 Max W/C : Max Agg Size : 3/8" #2

Strength Class : 2500 PSI Min Cement : Air Class : 2.5

Grading Specification :

Material Type	Description	Supplier Source	Design Quantity	Specific Gravity	Volume ft3
Cement	Cement Type I/II	Ashgrove Cement Co-Chanute, KS	358 lb	3.15	1.82
Fly Ash	Fly Ash	Mineral Resource Technologies, LLC-Chouteau,	89 lb	2.60	0.55
Water	Water	CITY-City-Potable	38.5 gal	1.00	5.15
Coarse Aggregate	3/8" #2 Cover	Pryor Stone Comapny Inc-Pryor Ok	1492 lb	2.63	9.09
Fine Aggregate	Concrete Sand	Anchor Stone	1595 lb	2.63	9.72
Admixture	Air Entrainment Agent(AEA)	BASF Construction Chemicals-Houston, TX	0.0 lq oz	-	-
Admixture	Water Reducing Agent(WRA)	BASF Construction Chemicals-Houston, TX	19.0 lq oz	-	-
Admixture	Mid-Range WRA (Poly 1020)	BASF Construction Chemicals-Houston, TX	0.0 lq oz	-	-
		Air Content	**2.50 %**	**--**	**0.67**
		Yield	**3855lb**	**--**	**27.00**

Prepared By :