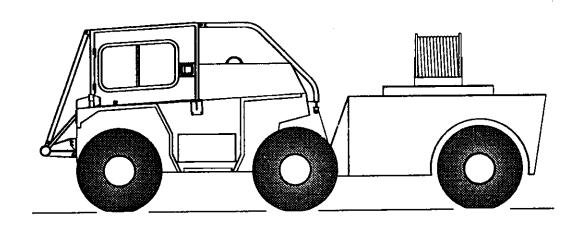
Project Number 53B August 1990



# Hard Cab & Slip-On Tank Designs for the Gamma Goat (M-561)





# Roscommon Equipment Center

Northeast Forest Fire Supervisors
In Cooperation with
Michigan's Forest Fire Experiment Station



#### A NOTE ABOUT GROSS VEHICLE WEIGHT (GVW)

American truck manufacturers have long relied on GVW (gross vehicle weight) to designate the maximum allowable loading of their vehicles. These gross weight limits are carefully established through numerous design considerations and often depend, among other factors, on the strength and life expectancy of such vehicle components as frames, axles, springs, wheels, tires and power trains. Most manufacturers will not guarantee their products if users exceed GVW specifications.

The U.S. Armed Forces are acutely conscious of the importance of vehicle reliability. They have insisted that manufacturers clearly specify gross vehicle weight and have rigidly adhered to these weight limits to the full extent that conditions will allow.

At the present time, a large number of military vehicles are becoming available to state and local agencies through federal government excess property programs and surplus sales. Many of these vehicles are being converted into fire fighting units. Those anticipating such conversions are urged to heed the GVW limits, and other vital information, posted on the dashboard of most of these vehicles. Federal excess property vehicles, onloan through State Forestry organizations, may be recalled if they are abused.

Blueprints and construction procedures prepared and issued by the Roscommon Equipment Center are intended to serve as guidelines for potential users of this equipment. It is possible that if all the options and alternatives specified on these drawings are used on any single vehicle, that GVW limits may be exceeded.

#### Therefore, users are cautioned to do the following:

- (1) plan design and construction carefully,
- (2) weigh each unit before actual duty assignments, and
- (3) make whatever weight adjustments are necessary to bring the system into safe load limits.

# Inquires, comments and suggestions regarding this project may be directed to:

Fire Protection U.S. Forest Service, NA 5 Radnor Corporate Center, Suite 200 100 Matsonford Road Radnor, PA 19087 Roscommon Equipment Center c/o Forest Fire Experiment Station P.O. Box 68 Roscommon, MI 48653

#### Disclaimer

Information contained in this report has been developed for the guidance of the member states, provinces and Federal agencies.

The use of trade, firm or corporation names is for the information and convenience of the user. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement or approval of any product or service to the exclusion of others which may be suitable.

# **Table of Contents**

Introduction	1
Cab Fabrication	1
Tank Units	2

Drawing Index					
Sheet No.	Description	Drawing No.			
1	M-561 Cab Assembly	90-5311C			
2	Cab Complete Weld	90-5305C			
3	Cab Frame Weldment	90-5304C			
5	Cab Sheets	90-5307C			
6	Door Complete	90-5309C			
7	Door Frame Weldment	90-5301C			
8	Door Details	90-5300C			
9	Bumper Weldment	90-5302C			
10	Bumper Details	90-5303C			
11	Rear Cab Supports	90-5308C			
12	M-561 Details	90-5310C			

## Introduction

This report shows a design for a steel cab for the M-561 Gamma Goat and its companion vehicle M-762 ambulance. It also discusses proper loading of fire apparatus, especially slip-on units, into the trailer portion of these vehicles. Refer to REC publication #53A for a more detailed discussion of the relative merits of the Gamma Goat in wildfire control.

## Cab Fabrication

Drawings included in this project show REC's design for a steel top M-561 cab. Doorway entrance size dictated much of the cab design. The M-561 requires a cab height much higher than needed for operator head clearance to allow suitable ingress and egress. REC's cab design revolves around the following criteria.

- 1. Utilization of the existing windshield.
- 2. Sound reduction of engine noise from behind operator.
- 3. Hard cab protection with doors and window ventilation (doors are removable).

The design prints show the needed information for construction. The M-561 has a C-section triangular shaped panel at the crew entry area. This panel must be removed for this design. When welding the tubular framework of the cab, be careful of warpage. The vehicle can be used as the welding fixture by mounting the vertical tubes to the vehicle, then welding the cross members (Drawing 90-5304-C). If multiple cabs are being produced, a special fixture may be more efficient. The cab mounting plates may need shims.

The aluminum body of the M-561 provides relatively light duty mounting points for the cab. This makes the limb risers and rear cab support tubes important. They attach to some

of the few substantial members helping to stabilize the cab mounting. The original M-561 front bumper (3" x 5.7# I-beam) can be used for the rear support assembly.

The rear cab support will interfere with engine hood use. Remove the existing hood handles and replace with fabricated ones shown (90-5310C). The lower rear cab panel (90-5307C) is removable. This allows access to the transmission cover without total cab removal.

The existing windshield is used. The front cab panel (90-5307C) trims the windshield to the cab. Closed cell foam weatherstrip should be used to seal at assembly.

The cab should be outfitted with door stops (90-5310C) to keep the door from over swing and allow installation of proper lights: these include turn signals and clearance lights. The night running lights, however, can be converted to turn signals by buying a yellow lens. Guard these as shown in the drawings to protect them.

The door panel is cut to allow installation of a sliding glass window. It is best to consult a good auto glass shop and choose the system you prefer, then cut the window opening according to directions. This design shows a generous 4-inch radius for the

weatherstrip gasket (90-5309C). This should be adequate in most cases. Use 3/16" to 1/4" thick safety glass.

The doors are removable. Locate the lower half of each hinge at assembly to make sure the door is hung with proper clearance. The latch catch may need grinding for smooth closure.

Because of the excessive engine noise behind the occupants, the cab panels should be sound insulated. Vehicle type insulating foam can be purchased, cut and adhered to the inside of the cab. One source is Milcut, Inc., P.O. Box 18645, Milwaukee, WI 53218. The door latch used was a typical stainless "slam" type. One source is Austin Hardware, P.O. Box 34007, Minneapolis, MN 55434. If other door hardware is preferred, you may need to adjust the dimensions and design of the door.

This hard cab design serves to protect occupants from limbs, brush, and falling debris. It has not been tested against any standard for roll-over-protection and should not be considered a roll-over protection (ROPS) structure.

## **Tank Units**

When it comes to balancing loads in the M-561, the vehicle should be viewed as two parts: a cab section made up of the chassis that sits on the front and center axles, and the trailer. Putting loads on the trailer ahead of the rear, or trailer axle, will add weight to the trailer's tongue. This adds weight to the center axle and removes weight from the front axle. The rear axle of the Gamma Goat is near the back of the trailer. For practical purposes, putting a load in the trailer box will add weight to the rear axle and center axle, and remove weight from the front axle.

Figure 1 shows the gross axle weight ratings and the curb weight of the Military M-561. Constructing a hard cab for the Gamma Goat will add significant weight, probably around 200 to 300 pounds. Much of the weight will fall on the front axle. It will be difficult to fabricate a substantial hard cab without exceeding the front axle weight rating. However, some of the weight can be counterbalanced by the fire apparatus placed in the trailer section.

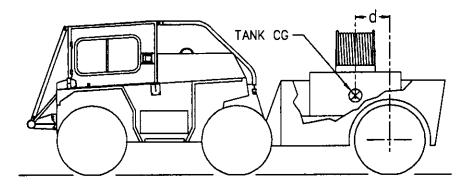
Figure 1, M-561 Gross Vehicle Weight Rating

	Curb Weight (LBS)	GVWR (LBS)	
Payload & Crew		2,960	
Front Axle	2,620	2,960	
Center Axle	3,125	4,045	
Rear Axle	1,700	3,540	
Total	7,445	10,545	

Figure 2 shows the approximate loaded weight of slip-on tank units of various capacities. This is based on typical fiberglass style slip-on tanks available commercially and outfitted with auxiliary gas engine pumps and hose reels. Note that if a hard cab, of the design shown in this booklet, is fabricated and mounted on the M-561, we recommend that a

both enroute to the fire and returning. Secondly, 200 gallon slip-on tanks with the hard cab and full water load should weigh less than the gross vehicle weight rating. This will also allow some capacity for storage. For tank systems less than 200 gallons we suggest a lighter cab design. This probably means no doors or windows.

Tank	Tank Size (Gal) Hard Cab	d Range (Inches)	Approximate Wgt. (lbs)		
			Front Axle	Center Axle	Rear Axle
200	YES	19	3015	3975	3480
200	NO	19-21	2680	3990	3445
150	YES	NOT RECOMMENDED			
150	NO	13-19	2720	3705	3220
100	YES	NOT RECOMMENDED			
100	NO	7-17	2910	3445	2730



slip-on tank of not less than 200 gallons be used. Further, we recommend that the center of gravity of that tank system be about 19 inches in front of the rear axle. Why do we recommend this practice? First, the 200 gallon water capacity will help offset the weight of the hard cab when fully loaded. In normal operating procedures we would expect the vehicle to be loaded when on the highway,

Note that, without the cab, we find slip-on units of less than 200 gallons acceptable with considerable flexibility as to where the tank can be placed. Unless a significant weight reduction effort can be made by the user in tank design or component removal, tanks of 250 gallons or more will not be reasonable for this vehicle.

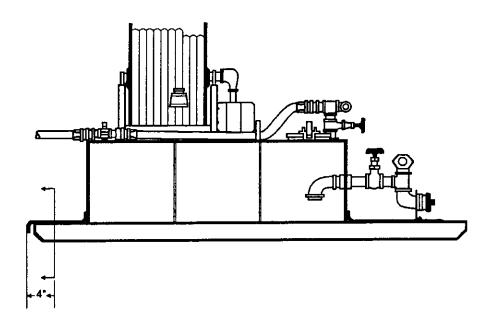
We recommend that the reader look at two basic options for Gamma Goat tank systems. One option is to use the slip-on tank design, detailed in REC Project #33 for the military's 5/4 Ton M-715. This unit will work with one exception: the forward platform of the M-715 tank needs to be shortened by four inches, this is shown in Figure 3.

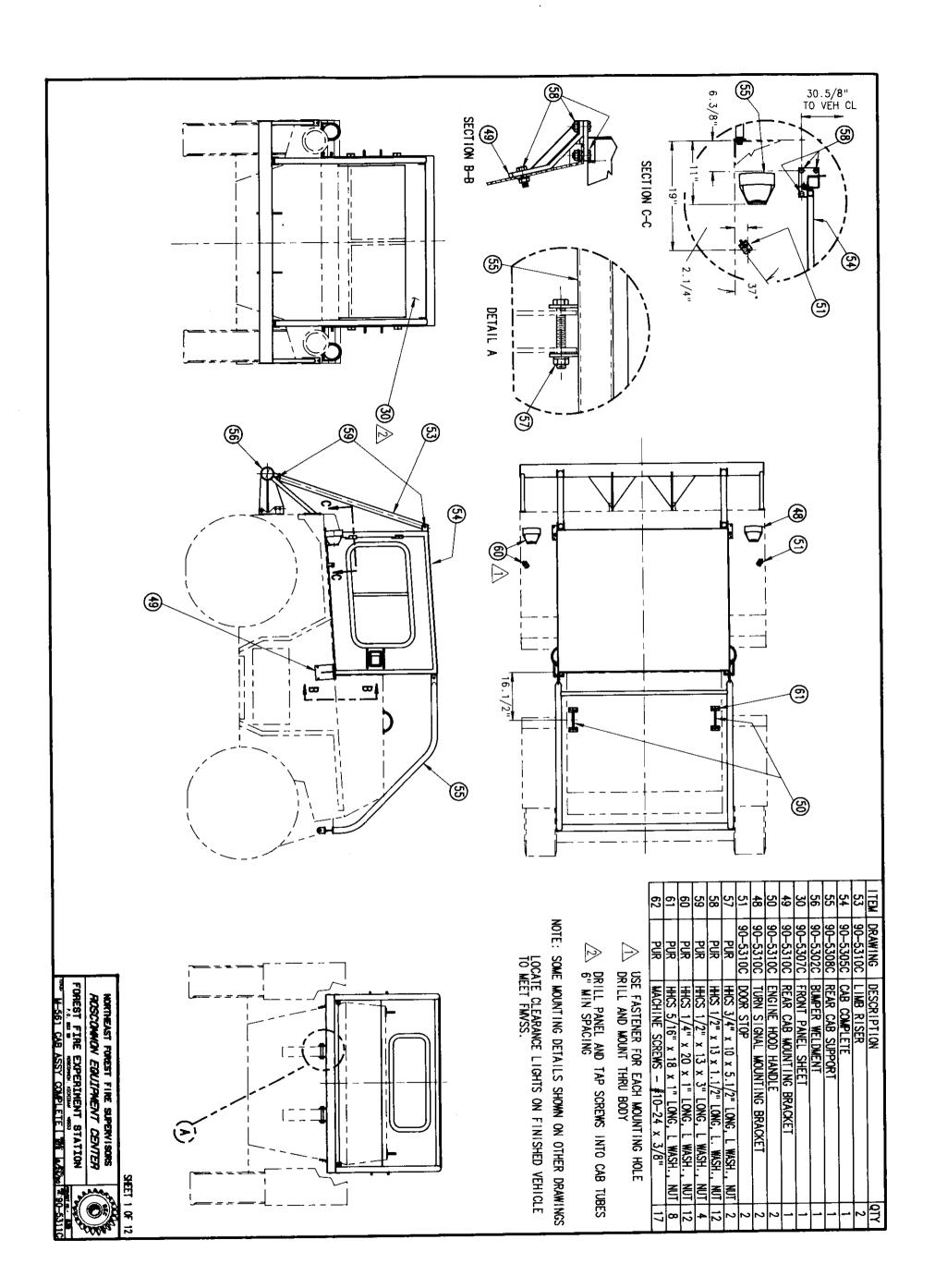
The second option is the use of a standard fiberglass type slip-on tank. These will be slightly lighter than REC's steel M-715 tank

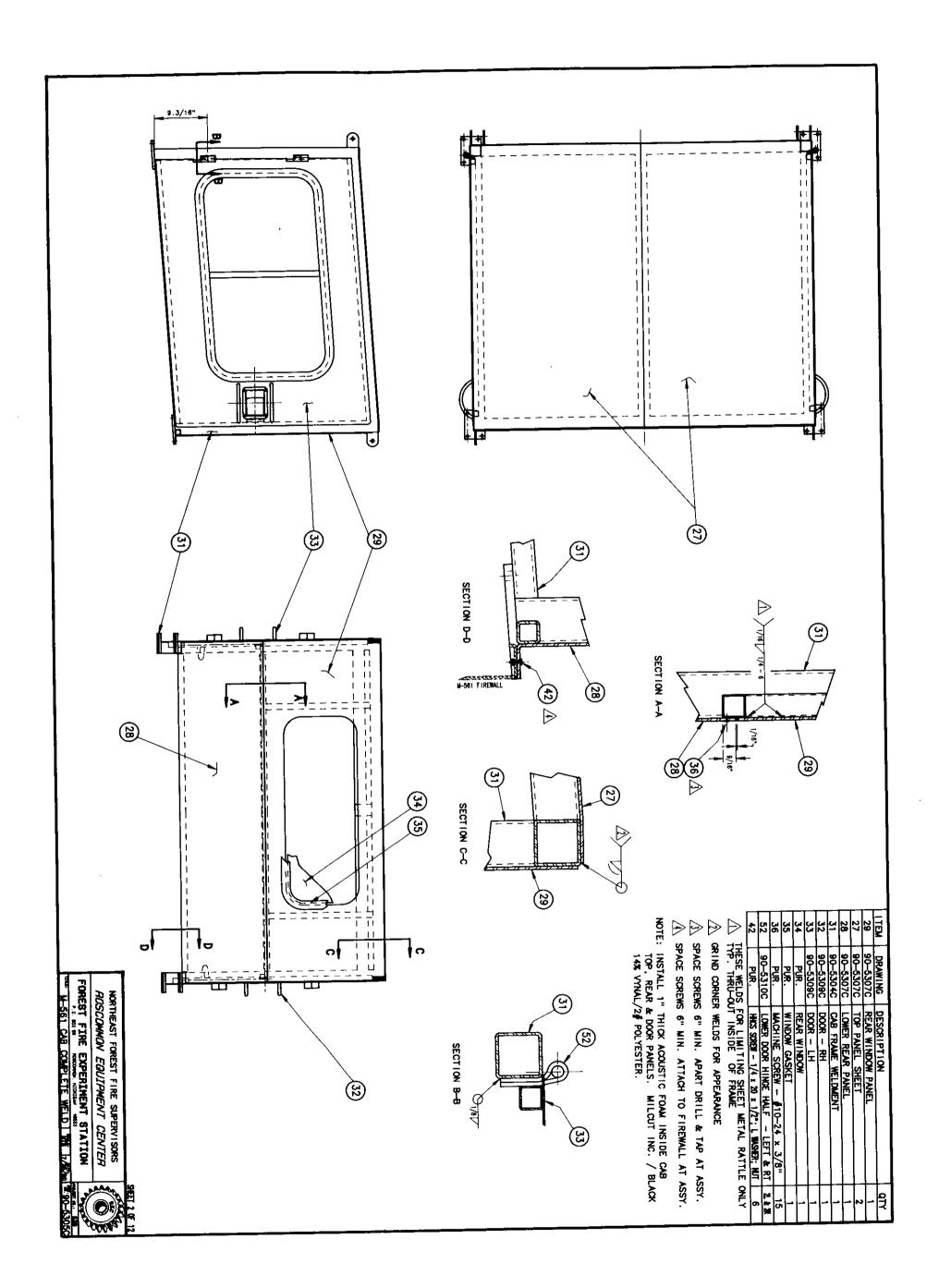
and high (pump) mount slip-ons are sized to easily fit in the Gamma Goat's trailer, allowing it to be placed correctly for proper weight distribution.

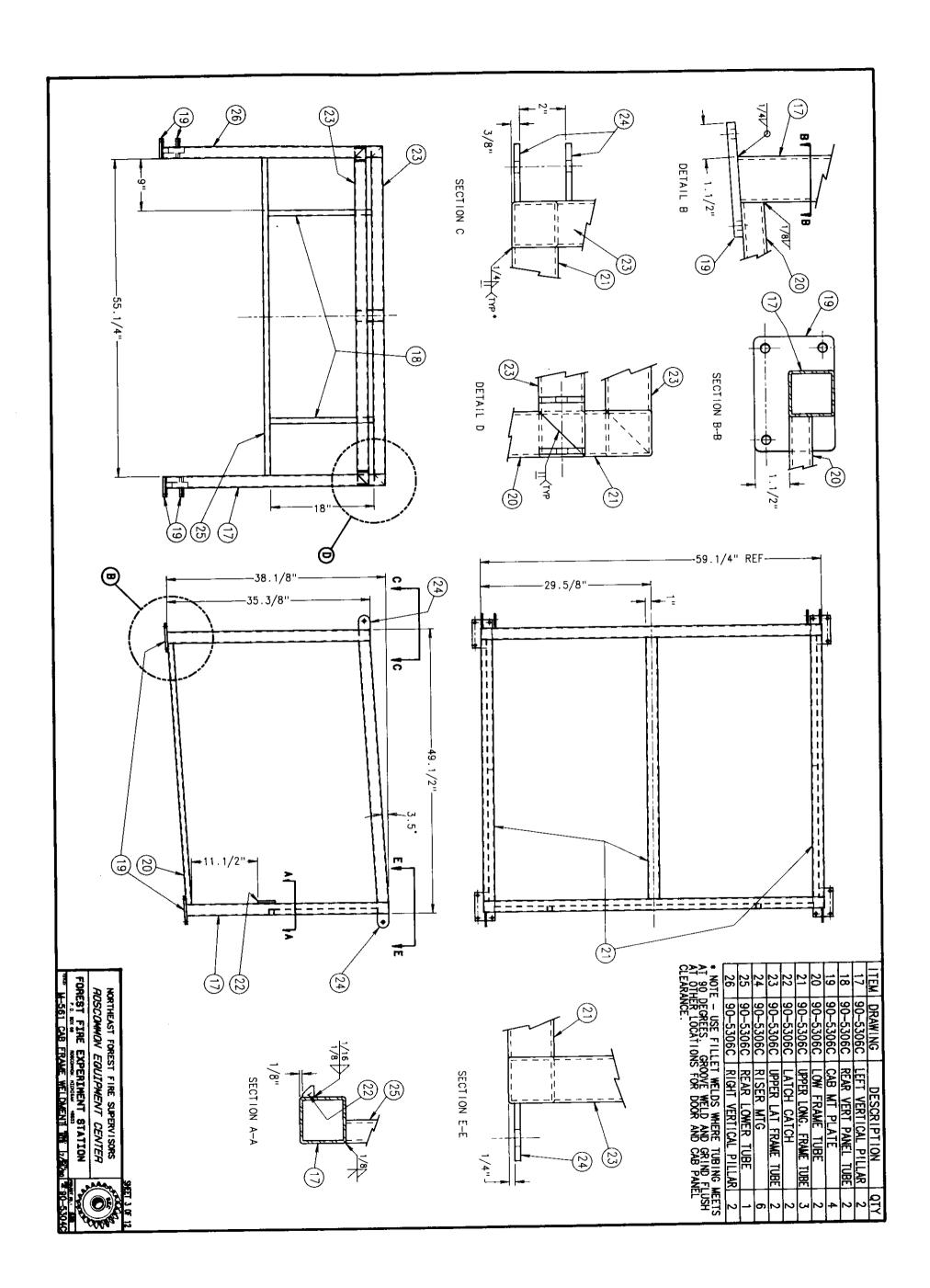
Take the vehicle to scales for weighing before use. Check to make sure that the weight does not exceed the gross vehicle weight rating before it is put on the highway.

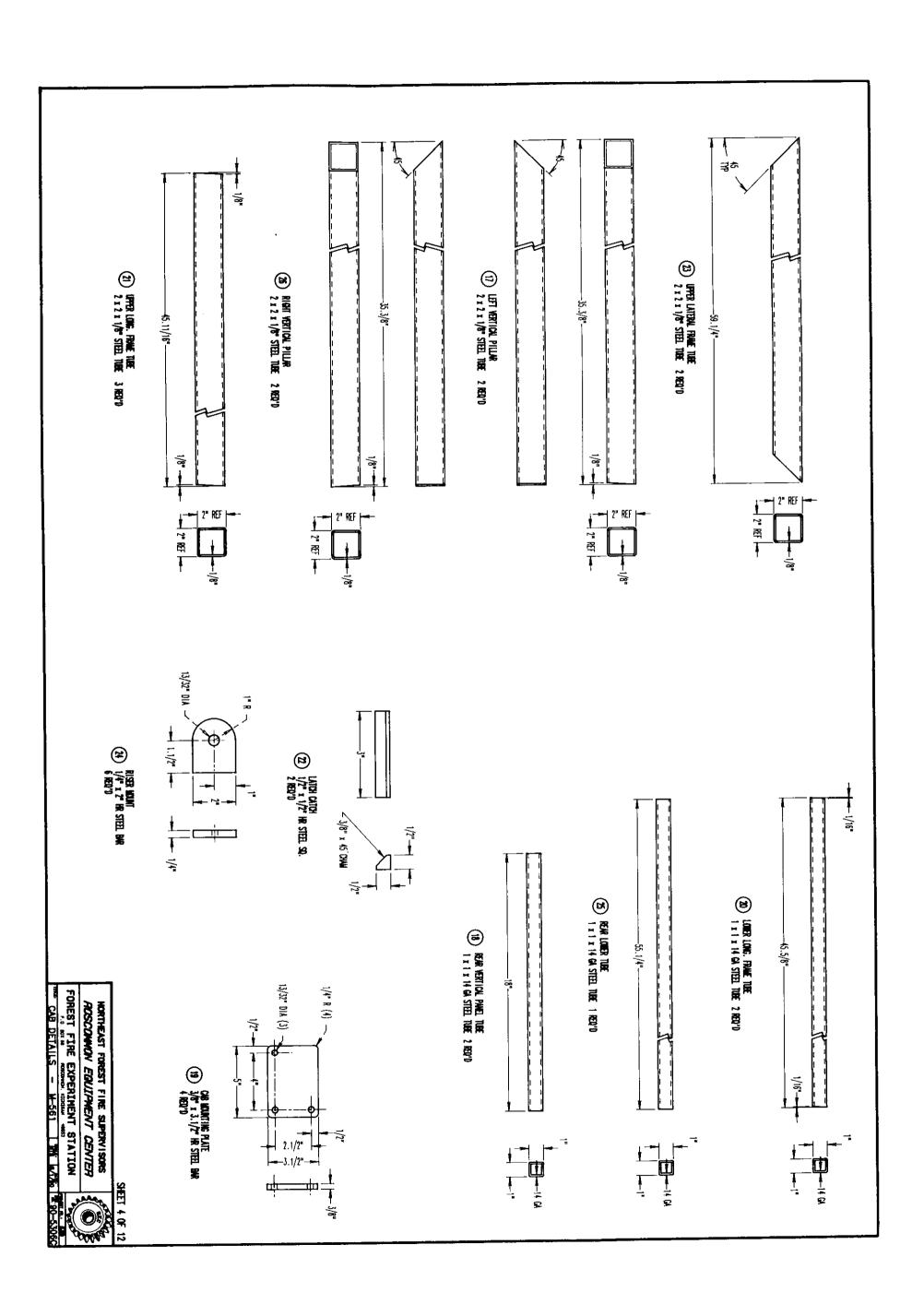
Figure 3, REC's M-715 slip-on tank design (Project #33) can be modified for the M-561 by removing 4 inches from the front of the tank assembly

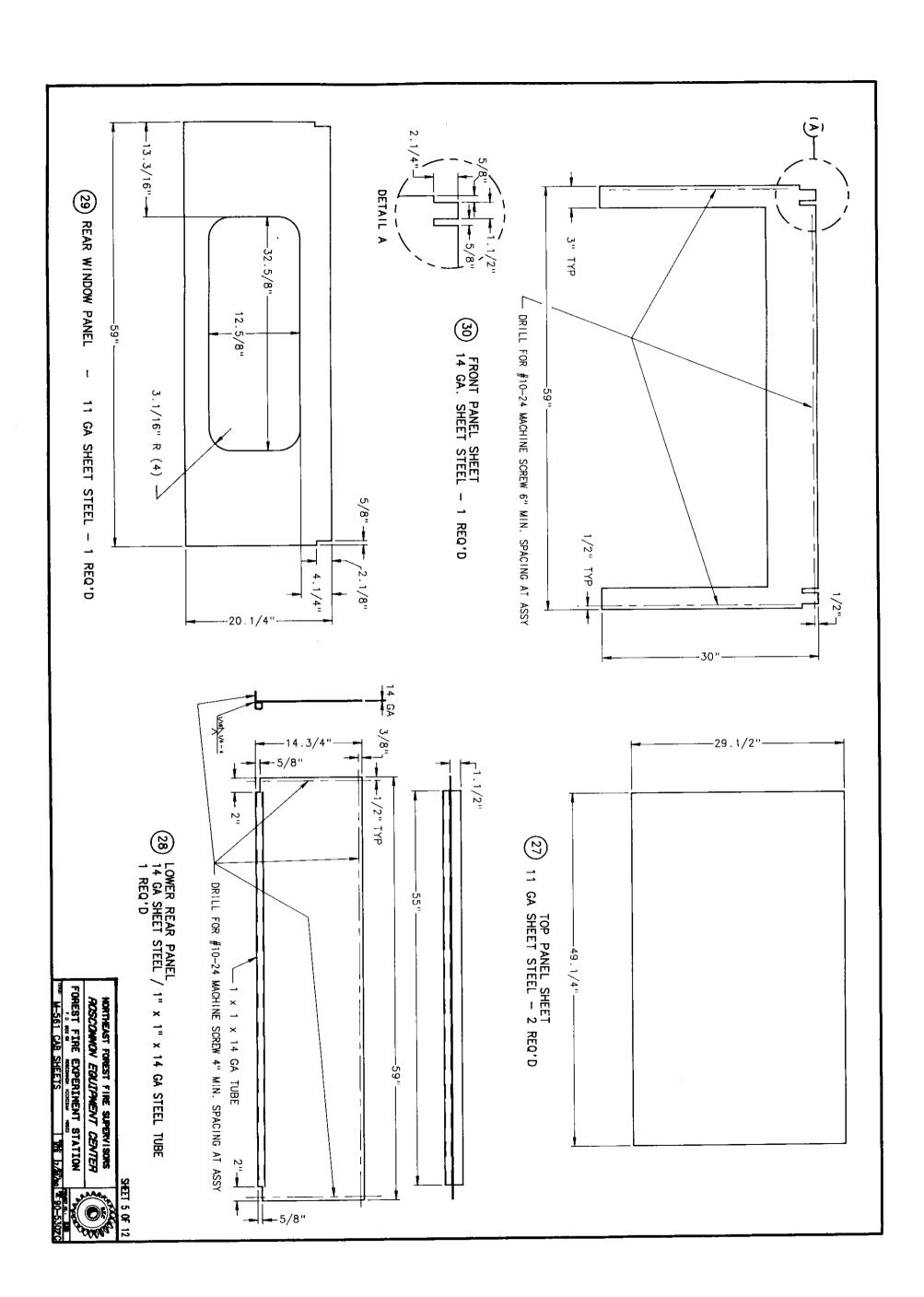


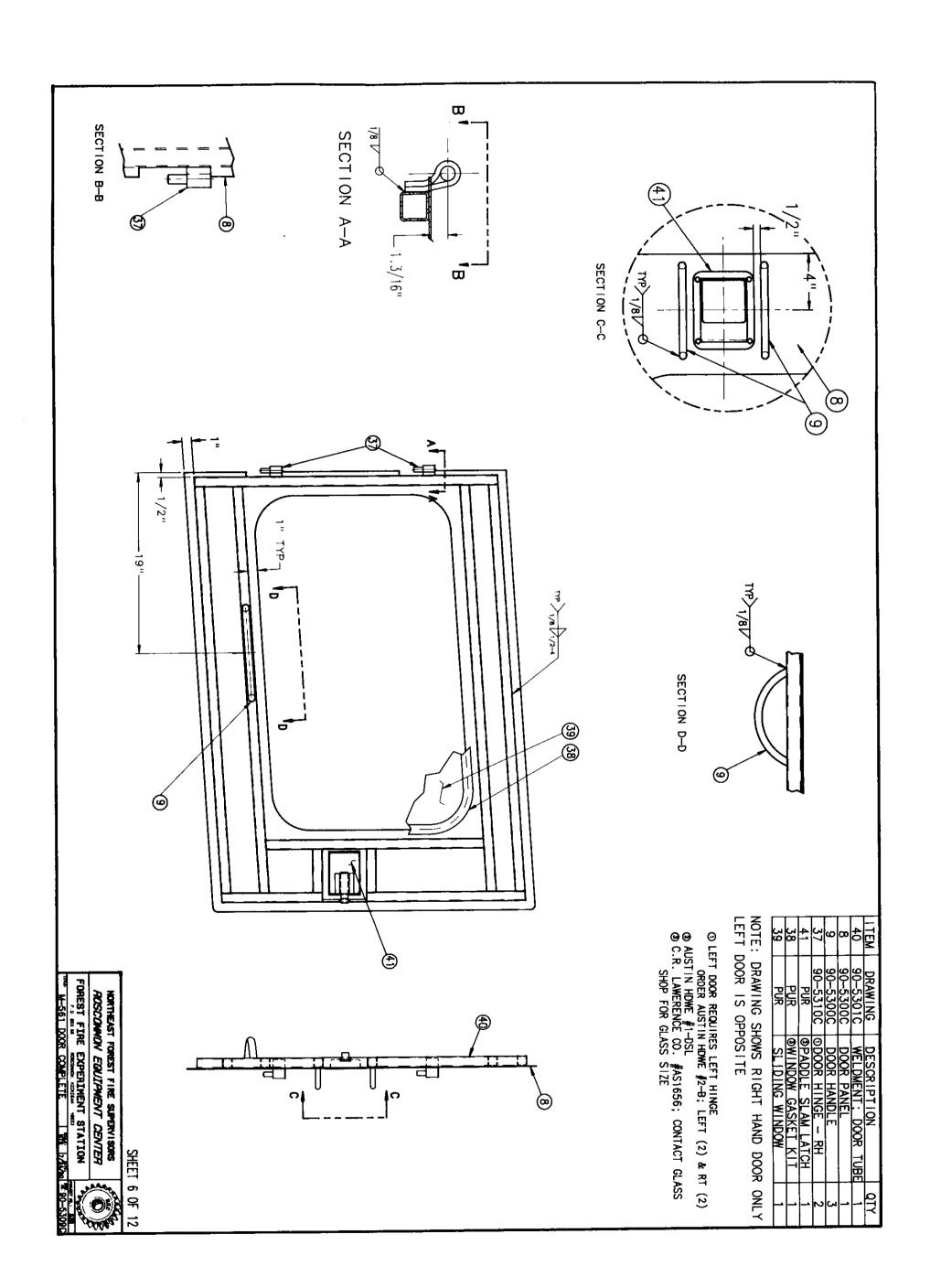


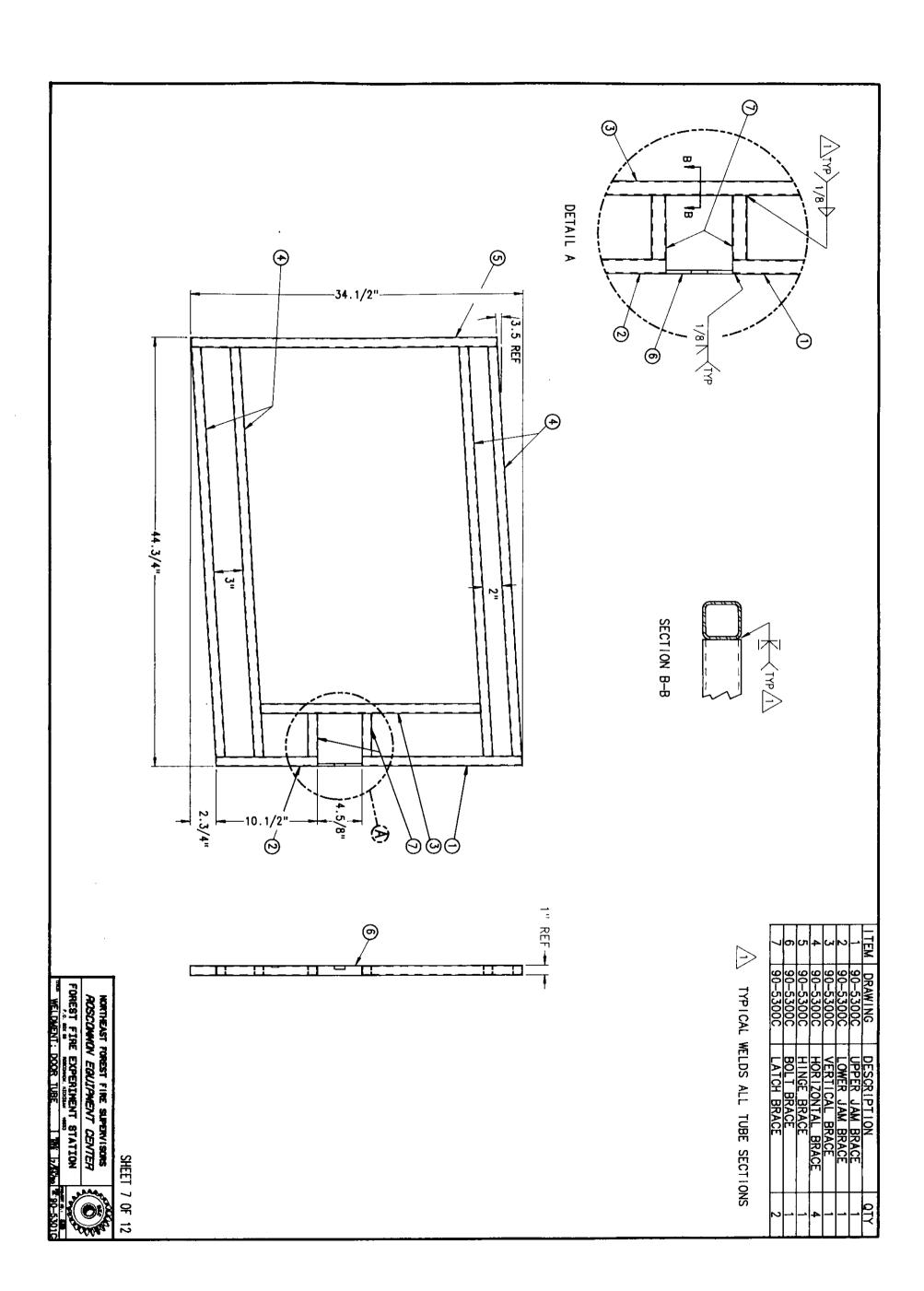


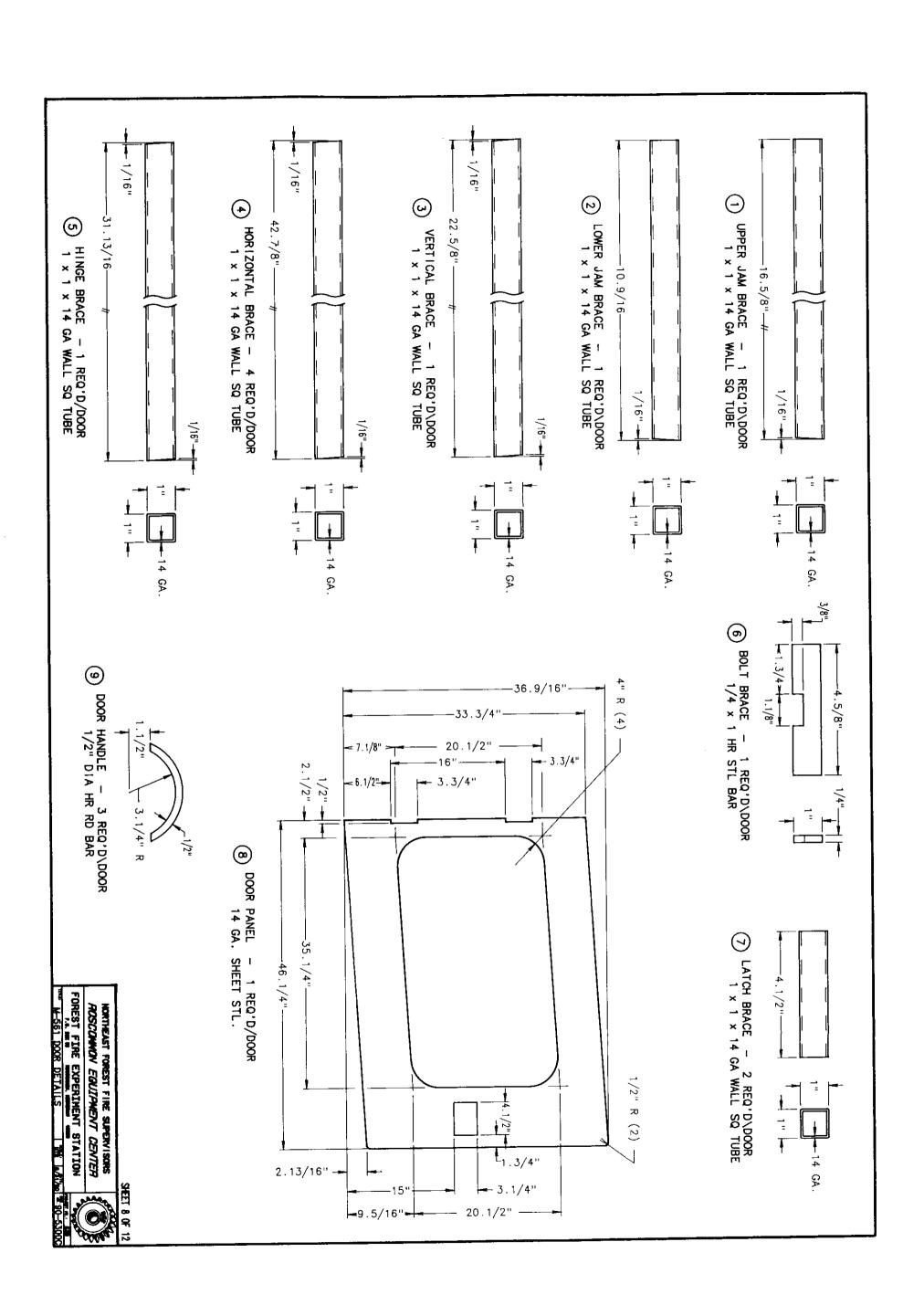


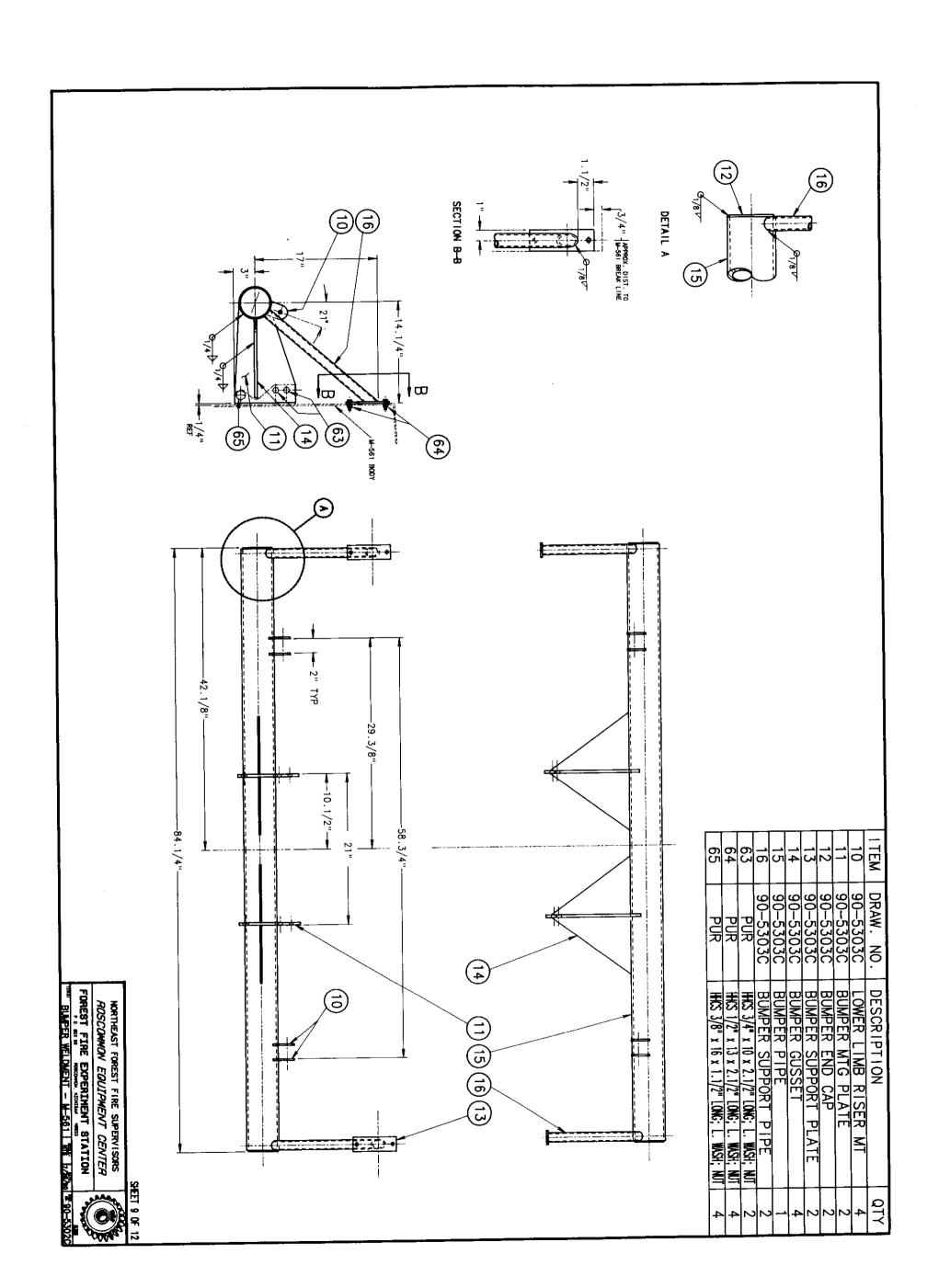


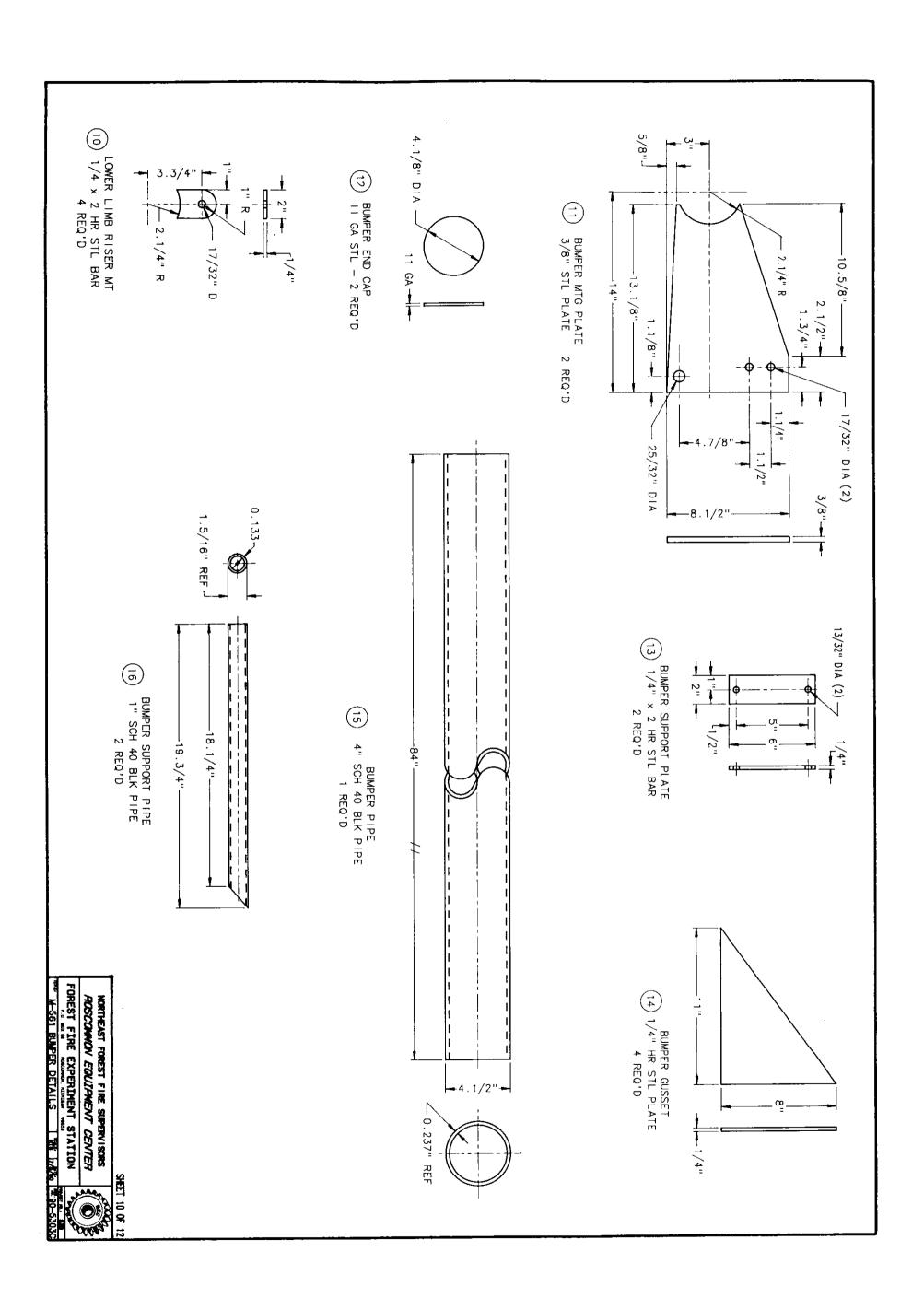


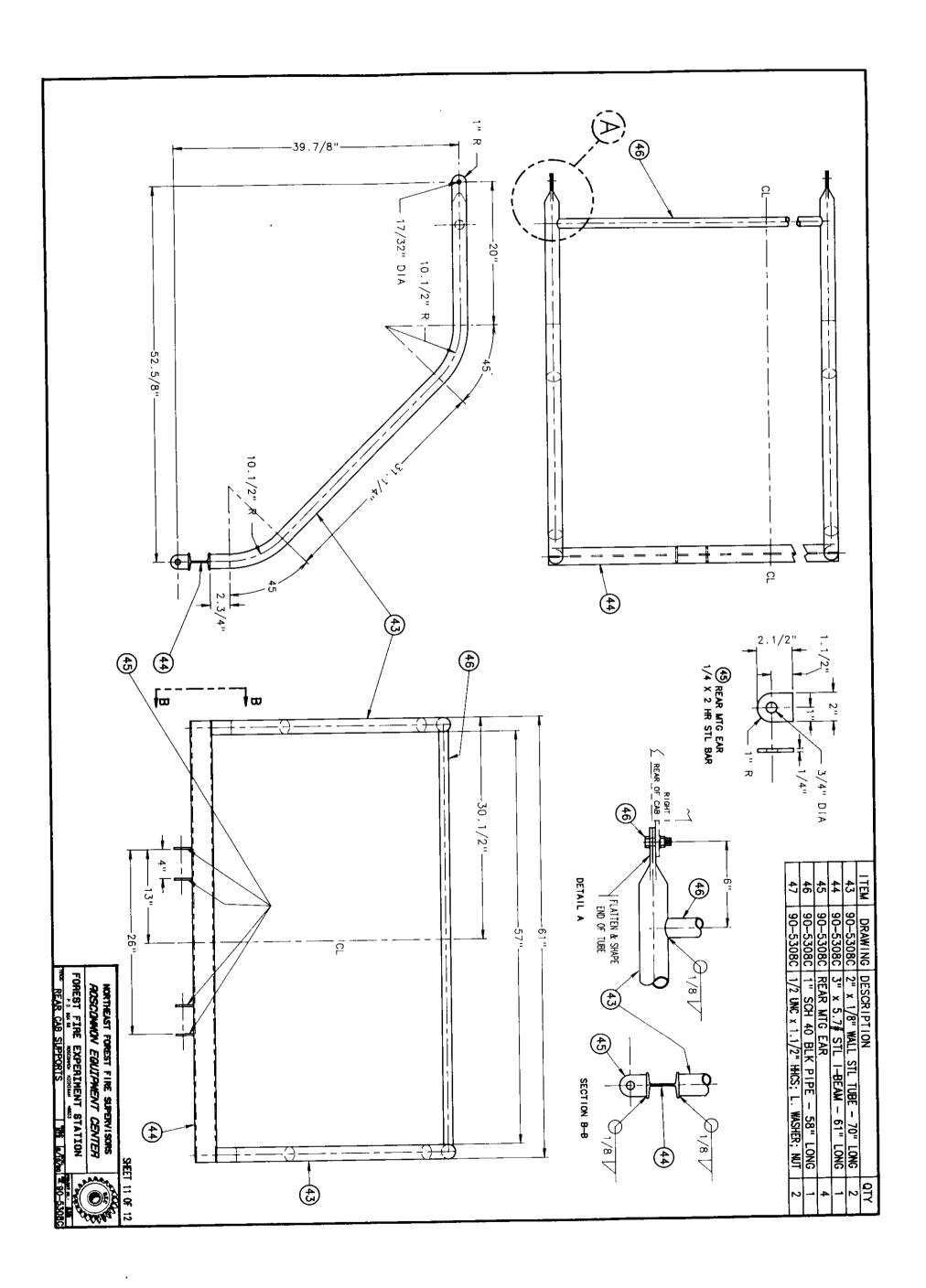


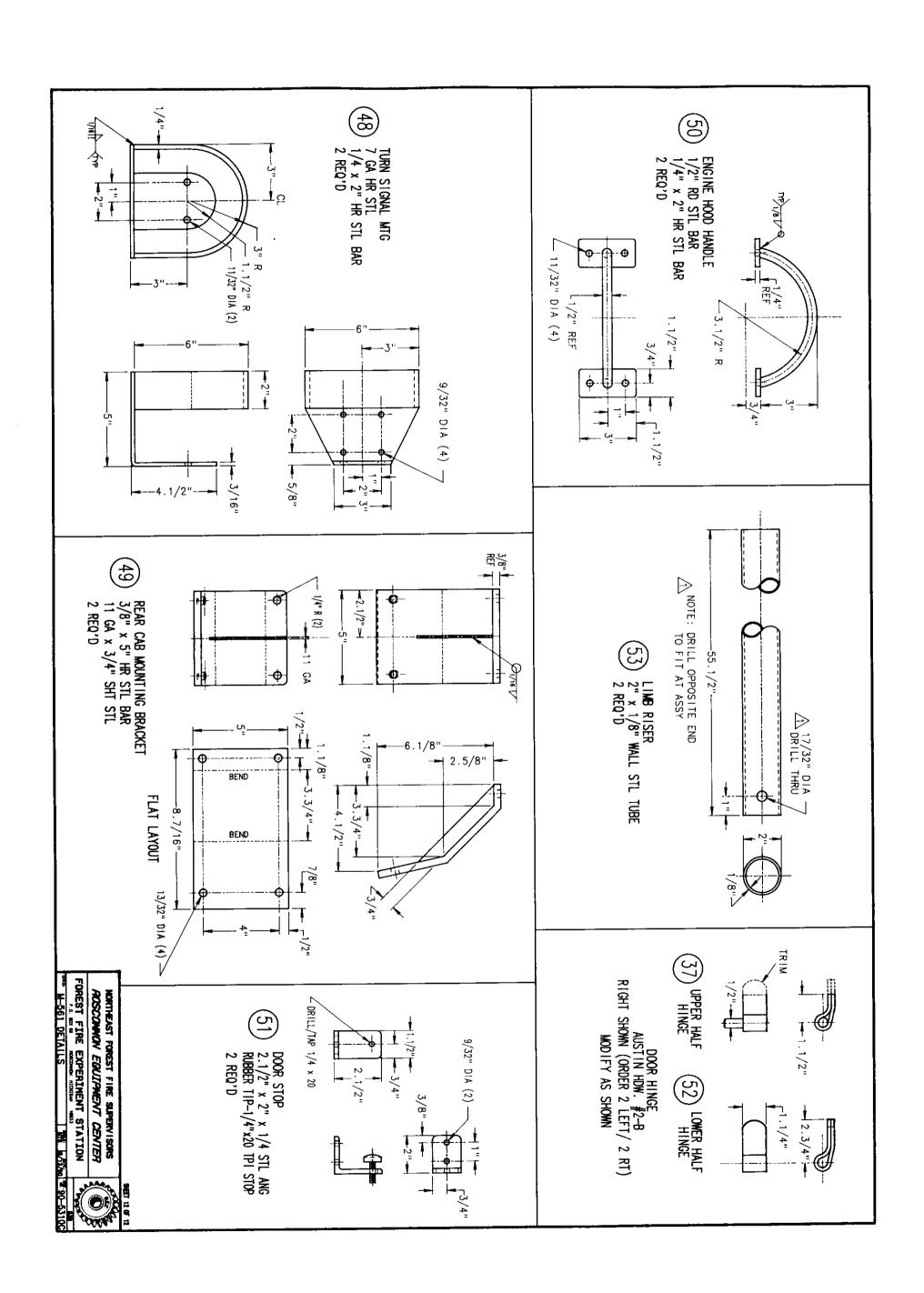












# GUIDELINES FOR USE AND ACCOUNTABILITY OF FEDERAL EXCESS PERSONAL PROPERTY

The objective of this program is to ensure efficient and economical rural community and wildland fire protection through the loan of Federal excess personal (FEPP) property to State forestry agencies.

The Federal Property and Administrative Services Act of 1949 (40 U.S.C. 483), as amended, and Section 7 of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2106) authorize and encourage the Secretary of Agriculture to loan Federal excess personal property to State and local fire forces for use in rural fire prevention and control activities. All Federal property acquisition, use, and disposal is governed by Forest Service Handbook 6409.31 - Federal Property Management Regulations.

The Federal Excess Personal Property Program is an assistance program coverd by 7 CFR 3015, Subpart I. Sections of Subpart R of 7 CFR 3015 shall govern program activities. Applicable assurance and compliance clauses of 7 CFR 3015.205 shall be incorporated into the agreements between, the Forest Service and the State Foresters.

State Foresters can acquire, use, and dispose of Federal excess personal property after entering into a cooperative agreement with the Forest Service. Cooperative agreements exist between the Forest Service and each of the 50 States, Guam, Puerto Rico, the Virgin Islands, and the Northern Mariana Islands. Personal use of any Federal excess personal property is prohibited. Failure to follow these guidelines may result in the suspension of a State FEPP Program.

Administration of this Federal-State cooperative program is the joint responsibility of the USDA Forest Service. State Foresters, and the General Services Administration.

The property must be identified as Federal property and in such a manner that indicates the cooperation between the State Forester and fire district or company. The State is required to keep a record of its assignment and to periodically inspect the equipment. Ownership is retained by the State Forester for the Federal Covernment.

The State is required to have a written agreement with each fire district (or company) that is assigned equipment. The agreement must stipulate insurance and liability conditions. Licensing is handled by the State.

When such equipment becomes unserviceable through use or damage, or is no longer desired by the fire company, it must be reassigned or disposed of by the States, using procedures established by the Federal Government.

NOTICE: This statement was reviewed and updated in June, 1988. The continued success of the FEPP program depends entirely on the absolute commitment of all users to abide by established rules for use of excess federal property in wildland fire management problems. Do not enter into an agreement unless you can abide by this statement of guidelines and accountability.

USDA - Forest Service